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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF
HARVARD UNIVERSITY—NO. CXXXIII

A CENTURY OF ADDITIONS TO THE
FLORA OF VIRGINIA¹

M. L. FERNALD

(Plates 626–649)

PART I. ITINERARY OF FIVE FIELD-TRIPS

Aided by a generous and greatly appreciated grant from the Penrose Fund of the American Philosophical Society, I was able to continue botanical exploration on the Coastal Plain of southeastern Virginia at intervals from June to October, 1939. Half the grant was used to cover the expenses of an all-summer botanical reconnaissance of the lower Santee valley in South Carolina (the home of Thomas Walter and a collecting ground of Stephen Elliott) by my students, Messrs. Robert K. Godfrey and Rolla M. Tryon, Jr., their results to be published in a separate paper. With the portion of the grant retained for the Virginia work I employed our already proved and efficient helper, Mr. Leonard Birdsall, maintained the established headquarters at Mrs. Bowman's at Century House, south of Petersburg, and met the expenses of equipment and a portion of those of travel.

Mr. Bayard Long, most happily, was able to join me for all five trips, most happily because the eastern Virginia work has

¹Exploration done with the support of a grant from the AMERICAN PHILOSOPHICAL SOCIETY.

now become intensive and wholly eclectic, with little or no attention devoted to the ubiquitous and well known species, our eyes being always on the alert for something which "does not register." Occasionally the failure of a plant to "register" proves humiliating but in two out of three cases the plant we do not at once recognize from the car or in walking through the unspoiled areas justifies a special stop; most often it is quite new to the known flora of the region and it frequently leads to the discovery of a new and productive habitat. Without Long's keen knowledge of Coastal Plain plants and his persistence in following clues to successful discoveries too many rare and excessively localized species would be overlooked. As it is, we are often amazed to find in supposedly familiar areas plants of great significance which, diverted by some other species, we must previously have overlooked. For instance, in June, 1939, attracted by an unusual composite, we slowed down near Applewhite's Church—to collect for the first time the remarkably distinct *Tetragonotheca helianthoides*,² a southern monotype (MAP 1), based by Linnaeus partly upon a Virginian specimen of Clayton's, but certainly rare in eastern Virginia. That discovery soon led us to a rich strip of undisturbed woodland along the Nottoway near Carey Bridge, on the plantation of Mr. S. R. Westbrook, who readily granted us permission to botanize over the area. Our interest absorbed by many unusual species, we perhaps had blind spots for others. At any rate, returning in June, 1940, we found on the springy wooded slopes which we had canvassed during three days at the same season the year before such extraordinarily conspicuous species as an *Aconitum*, leaning and twining on the neighboring shrubs, a plant not yet in flower but presumably *A. uncinatum* of the interior; the true and famously rare *Sphenopholis pallens*

² In this, as in preceding papers of this series, the authors of species are omitted in the narrative if they are in Gray's Manual. The preceding papers on the work in Virginia are as follows: Fernald & Griscom, *Three Days of Botanizing in Southeastern Virginia*, RHODORA, xxxvii. 129-157 and 167-189, 20 plates (1935)—Contrib. Gray Herb. CVII; Fernald, *Midsummer Vascular Plants of Southeastern Virginia*, RHODORA, xxxvii. 378-413 and 423-554, 22 plates (1935)—Contrib. Gray Herb. no. CIX; Fernald, *Plants from the Outer Coastal Plain of Virginia*, RHODORA, xxxviii. 376-404 and 414-452, 13 plates (1936)—Contrib. Gray Herb. no. CXV; *Local Plants of the Inner Coastal Plain of Southeastern Virginia*, RHODORA, xxxix. 321-366, 379-415, 433-459 and 465-491, 14 plates (1937)—Contrib. Gray Herb. no. CXX; *Noteworthy Plants of Southeastern Virginia*, RHODORA, xl. 364-424, 434-459 and 467-485, 27 plates (1938)—Contrib. Gray Herb. no. CXXIII; *Last Survivors in the Flora of Tidewater Virginia*, RHODORA, xli. 465-502, 529-559 and 564-577, with 14 plates (1939)—Contrib. Gray. Herb. no. CXXVIII.

(Spreng.) Scribn.,³ of which, as stated by Hitchcock (*Man.*), "The only other specimen [besides the original of more than a century ago, sent by Muhlenberg to Sprengel, supposedly from Pennsylvania] known is the type of *Eatonia aristata* collected [somewhere] in South Carolina by Curtiss"; and, beneath them, carpets of a reclining rhizomatous *Cardamine*, with showy petals deeply cleft like those of some species of *Silene*. A few miles away, in another area north of Applewhite's Church, where we had extensively botanized one year earlier, there was a very definite and apparently heretofore unrecognized *Carex*, although it exists, misidentified, in some of our herbaria from Georgia and Florida. In these cases, each species is so highly localized that, passing a rod or two on either side of their small colonies, we might easily have missed them all the second year. They again illustrate the truism, that no area is ever fully worked out. Needless to state, it was Long who first detected three of the four.

Our first field-work of the summer of 1939 was from June 11–24. We had some problems left over from previous years which demanded immediate attention. On our first trip on the inner Coastal Plain, in June, 1936, we were amazed to find in open woods and clearings a species of *Andropogon* in the prime of flowering and early fruiting. Dreading the complexity of the genus, we tentatively set it aside as an aberrant colony of *A. scoparius*, a variable species normally flowering in September and October. But the plant could not be thus disposed of. Every June it abounds in open woods, clearings and fields as a regular element in the late-spring and earliest-summer vegetation, from Dinwiddie County at the west, York County at the east, thence south nearly to the North Carolina line; and Godfrey & Tryon got it, over-ripe and shattered in July, in southeastern South Carolina. Best of all, it has strong morphological characters separating it from *A. scoparius*. It is a vernal species, nearest related to an autumn-flowering endemic of Texas. It will be described and illustrated (PLATE 626) in Part II.

Another characteristic plant of the region, also found by us in June, 1936, and subsequently much collected, from May into July, on the rich wooded bottomlands, is a gigantic quillwort,

³ *S. pallens* true, not that of most treatments, which is the transcontinental *S. intermedia* Rydb.

Isoëtes. Flaccid and sprawling in the richest woods, with bulbs up to 3 cm. in diameter and loose rosettes up to 9 dm. across, it always fascinates us, for it is decidedly not an aquatic; and on many bottomlands, from Dinwiddie County to Greenville and western Nansemond, it is impossible to walk in June without trampling upon it. It proves to be the little known *I. Engelmanni* var. *caroliniana* A. A. Eaton, described from along creeks tributary to the Tennessee River in westernmost North Carolina but subsequently found in Georgia (MAP 2), another of the upland and inland types reappearing on the Coastal Plain of Virginia.

These were a good start and on our first full day in the field (the 12th) we began brand new discoveries. On one of the earlier trips we had hoped for good things about Taylor's Millpond in southeastern Greenville County but, alas, it is a conventional millpond, formed by damming a stream, with water lapping the drowned marginal forest and without a natural beach, such as we are constantly seeking. Taylor's Millpond was promptly given a black mark. On June 12th, however, the region came into botanical favor. After making brief visits to old areas near Skipper's and Dahlia, we took the dirt road east from Skipper's (that from Dahlia has become impassable), planning to explore via any side road which looked tempting. Suddenly, beyond an open pine wood, we saw a swale. That meant moisture and perhaps a sphagnous bog. Sphagnum was there in abundance but we were on a ruined remnant of several acres of what was once a good habitat. The plow had been there, although, as is so often the case, the heavy and soggy clay land is unfit for agriculture. Only a few of the original bog plants remained, *Panicum strigosum* and some *Droseras*; but here was the greatest assemblage imaginable of the bog species of *Lycopodium*, which seemed to have profited by cultivation of the land. *L. alopecuroides* and *L. inundatum* vars. *adpressum* and *Bigelovii* formed a nearly continuous carpet, and at one end of the swale there was the rare *L. carolinianum*. It is sometimes listed as a Virginian, but in their monograph of the genus (1900) Lloyd & Underwood were unable to cite any specimens from between southeastern North Carolina and southern New Jersey, although it has long been known at a single station in Prince George

County, Maryland. In June *L. carolinianum* was very immature but we made regular monthly calls, to watch its development. On our September visit the swale was under two feet of rain-water. We then wallowed and tumbled about the submerged furrows, well above our knees in muddy water, and, reaching arm's-length below, pulled up strobiles of *L. carolinianum* 7½ cm. long, of *L. alopecuroides* 1 dm. long and of *L. inundatum* var. *Bigelovii* 1.1 dm. long, of var. *adpressum* 1.2 dm. long. After this hydropodic and most novel adventure among the *Lycopodia* we gladly replaced Taylor's Millpond upon the botanical map.

Taylor's Millpond further justifies its existence as a focal point of botanical note because slightly to the southeast a dirt road leads across and along the wooded bottomland of Fontaine Creek into North Carolina. The bottomland, where not too heavily wooded, is a tangle of southern sedges, *Carex louisianica* Bailey up to 7.5 dm. high (Mackenzie says 2–6 dm.), *C. crus-corvi* var. *virginiana* Fernald, *Scirpus atrovirens* var. *flaccidifolius* Fernald, and several others. At the upper border of the bottomland there is a fine clump of *Amsonia Tabernaemontana*, the typical variety, not recorded by Woodson in his monograph of the genus as native north of South Carolina. Farther out, at the margin of the Creek, *Sagittaria Weatherbiana* Fernald mingles with an orchid with oblanceolate leaves 3–3.5 cm. broad. In June the latter was not yet flowering, and the colony was deep under water until the end of September, when, from among the clay-crusted leaves, the characteristic long raceme showed it to be *Spiranthes cernua* var. *odorata* (Nutt.) Correll (*S. odorata* Nutt.), a giant plant for its group, though in September and October we found it on tidal marshes farther north reaching a greater stature (up to 7.5 dm. high).

On the 14th, Godfrey, on his way to South Carolina, joined us for half-a-day. After showing him some of the specialties between Petersburg and Emporia, we drove east to look at the bottomland of Three Creek, between James River Junction and Grizzard. In what was once a sphagnous bog along the Southern Railway *Sarracenia flava* and a few other bog species still held their own (though apparently completely obliterated by ditching operations later in the summer). Here was a new in-

land limit for *Erigeron vernus*, and the second station in Virginia and east of the Mississippi valley of *Eleocharia tenuis* var. *verrucosa* Svenson. On the bottomland, where we went to show Godfrey *Glyceria arkansana* Fernald and other species not recorded from neighboring North Carolina, we were greatly impressed by *Peltandra virginica*. In New England, New Jersey and Pennsylvania the plant we know by that name has a tightly rolled green spathe with closely appressed pale margins which loosen without spreading more than just enough to allow the entrance of insects and snails to the closely surrounded whitish spadix. Here on Three Creek, however, the spathe loosely opens, its creamy-white margin spreading and fully exposing the deep orange-yellow spadix. At the summit of the enclosed ovary the spathe is circumscissile, a deliquescent band soon developing at this point, so that the limb of the spathe very soon drops off, leaving a truncated young fruit. This prompt circumscission of the limb of the spathe I have not seen in Massachusetts. Furthermore, the pale spadix of the northern plant is covered with flowers essentially to its tip; the orange-yellow spadix of the eastern Virginian has the upper inch or so often sterile. On all the streams we have yet visited in southeastern Virginia *Peltandra* is uniform; and Dr. Lily M. Perry informs me that this plant with open spathe and yellow spadix is what she knew in Georgia. *P. virginica* was based on the brief description by Gronovius of the Virginian plant of Clayton. It is probable that the northern plant is not *P. virginica*. The spathe and spadix of each will be shown in PLATES 627 and 628.

Attending the meeting of the Botanical Society of America at Mountain Lake and Blacksburg, where we were the guests of Professor and Mrs. Massey, we got back into our special field-work on the 18th. Wishing to check on *Peltandra*, we took a side road, leading from near the Prince George-Sussex County line from the Jerusalem Plank Road across to Stony Creek. On the first bottomland, that of Jones Hole Swamp, we were collecting the calla-like spathes when a passing fisherman, looking down from the bridge, remarked: "Oh! getting water lilies?" That seems to be a general name for *Peltandra virginica* in the region, more appropriate to it than to the northern plant. On the wooded bottomland of Jones Hole Swamp *Rhododendron*

canescens was frequent, the first we had met in Virginia, though we afterward got it in woods along other portions of the Nottoway system. This is true *R. canescens*, as restricted by Rehder, who, in his monograph of the group, gives its range as extending "from southwestern Tennessee and southern central North Carolina" southward and southwestward. Somewhat northeast of Stony Creek and again both north and south of that botanically productive center swampy woods were characterized by pin oak, *Quercus palustris*, which we also found along Three Creek, farther south. We had never before met it on the Coastal Plain of the state and Sargent (*Man.*) cites it as occurring in Virginia south of the Potomac only in the mountains (Wythe County). It has, however, been reported from several counties, including Amelia, which approaches the Coastal Plain, and Charles City County which is upon it. As it turned out, the day was primarily devoted to trees and shrubs. Driving eastward to Sussex Courthouse, then to Homeville and Waverly, we stopped on the west side of the Nottoway, where the ash-keys attracted us by their extreme smallness. They were on *Fraxinus americana*, var. *microcarpa* Gray, a southern extreme which we had not previously met. On the east side of the river, nearer Homeville, the forest was so rich that we returned next morning for further collecting. *Carya ovata* var. *pubescens* Sargent, recorded from Alabama and Mississippi northward into South Carolina and Tennessee, abounded, and with it the southern *C. pallida* Ashe. At one point in the drier forest above the bottomland *Arabis canadensis* abounds, our first Coastal Plain station; and near it was a carpet of *Paronychia fastigiata*, var. *paleacea* Fernald, heretofore known only from Delaware and Pennsylvania to Illinois and Tennessee. Another extension southward to Virginia was noted when we stopped, as we usually do, at the border of Assamoosick Swamp, northeast of Homeville. A bramble there was one of the arching or doming but tip-rooting series midway between dewberries and high blackberries. I cannot separate the material from that of *Rubus Janssonii* Bailey, of southern New England.

Exploring, still unsuccessfully because of the clearing of land and the turning in of hogs on most boggy areas, with the hope of rediscovering Pursh's stations of 137 years ago, some of them

on "boggy meadows near Dr. Gray's,⁴ Southampton", others simply from "swamps, Southampton", we covered much of the county. Pursh's material, at the Philadelphia Academy, shows familiar Southampton County plants, such as *Stillingia sylvatica*, *Asimina parviflora*, *Quercus laevis*, *Sarracenia flava*, *Amianthium Muscaetoxicum*, *Lobelia glandulifera*, *Carphephorus bellidifolius* and *tomentosus*, and others which are now very local. But we wanted to find in the county *Gentiana Stoneana* Fernald (*G. linearis* in Pursh's herbarium), from "swamps, Southampton" and *Asclepias paupercula*, "wet swampy woods, Southampton". We already have them from farther east, so that their rediscovery is of secondary importance. But of the very first importance is the fact that Pursh got in "swamp, Southampton" the very rare *Litsea geniculata*, probably not subsequently collected in the state; and "in rich hedge-rows, Dr. Gray's", *Baptisia villosa*, a species also collected by Canby near Franklin in 1867. As yet these two are unknown as living species in the state. During these searches we found on the old road from Sebrell to Courtland an area of white sand, with the remnant of a forest of Catesby's oak, *Quercus laevis*, and with *Q. cinerea* Michx. at a new northern limit. *Stillingia* is abundant, perhaps where Pursh got it, but at its northernmost known station; *Bulbostylis ciliatifolius* (Ell.) Fern. also is there at its northern limit, and at the margin of Assamoosick Swamp *Nyssa sylvatica* var. *dilatata* Fernald abounds. The area was so promising that we registered it for later visits.

I have referred in the opening paragraphs to the region of Applewhite's Church and of Carey Bridge. Here is an area of alternating rich loamy (often calcareous) woodland, more sterile sandy woods and wooded bottomland. The unique *Tetragonatheca* (MAP 1), with four big foliaceous bracts subtending the sunflowerlike heads, the distinctive achenes becoming conspicuous, was found in two spots. In the woods were *Onosmodium virginianum* and a complex series of *Houstonia*, from typical *H. lanceolata* to extreme *H. tenuifolia*. It begins to look as if Gray's old treatment, of combining several of these as variations of one species, were sound. *Polygala polygama* abounds and is

⁴ Edwin Gray, proprietor of much of Southampton County in the late 18th and early 19th centuries, buried between Sebrell and Wakefield.

strikingly unlike the more northern plant in its very lax raceme with distant and relatively large flowers. It is true *P. polygama* of Walter at its northern limit, the plant of the North, with more crowded and mostly smaller flowers being var. *obtusata* Chodat. *Viola triloba* var. *dilatata* (Ell.) Brainerd ("southwestern Louisiana northward to northern Oklahoma, southern Missouri, and southern Illinois; thence eastward to northern Georgia and western North Carolina") was there, with scattered *Chamaelirium luteum* and *Carex striatula*. *Viburnum rufidulum*, rarely flowering, was here heavily in bloom, some of the trees 20 feet high, with trunks 4 inches in diameter, the blackish bark broken into rectangular blocks suggestive of the bark of *Diospyros*. Small trees of *Vaccinium arboreum* (up to 20 feet high, with trunks a foot in diameter, the main branches 6 inches through) were also very beautiful, with their loads of milk-white drooping flowers.

At the point where Mr. Westbrook's bridge crosses Three Creek an old woodroad leads up the latter stream to pits from which the shell-marl was long ago dug out. Here, as exclusively in line as elsewhere in eastern Virginia, *Equisetum arvense* and *E. hyemale* var. *affine* abound; and the thousands of plants of *Ponthieva racemosa* (Walt.) Mohr give encouragement that this southern orchid may hold its own in Virginia. In deep woods along the bottomland *Ampelopsis arborea* occurs and near it sterile plants which could be only the rare *Chelone obliqua*; and later in the year we here established a new southern limit on the Coastal Plain for the Canadian and Alleghenian *Prenanthes altissima*.

At a crossing of Three Creek slightly farther up-stream, on the road north from Applewhite's Church, *Rhododendron canescens* abounds; and on the steep slopes with *Antennaria solitaria* we got our first Coastal Plain material of the upland *Cunila origanoides*.

The last full day in the field in June (23rd) we went to some of the old ferry-landings on the Nottoway and the Blackwater. The tidal shore at Knight's Seine Beach (Battle Beach of the contour-sheet) on the lower Nottoway was showy with masses of flowering *Zizaniopsis*, with great swales of *Rhynchospora caduca* Ell. and other nice species farther back, but our great prize here

was the first collection of the season (by no means the last) of the estuarine *Isoëtes saccharata*, not seen by Pfeiffer from south of the Potomac at Alexandria. Later in the summer and autumn it proved to be a regular inhabitant of tidal shores. Since Battle Beach is almost in North Carolina, just above the junction of the Nottoway and the Blackwater which form the tidal Chowan River, the *Isoëtes* will certainly be found in North Carolina. At Cobb's Wharf,⁵ on the west bank of the lower Blackwater, there are good swales. *Panicum albomarginatum*, not too common in Virginia, was in fine condition and *Lysimachia producta*, which we had not previously collected in the state, abounded, quite by itself, with no *L. quadrifolia* nor *L. stricta* (sometimes thought to be its parents) seen. Best of all, there were splendid great clumps in perfect vernal flowering of one of the very rarest of grasses, *Panicum cryptanthum* Ashe, which had been unknown between southeastern North Carolina and its local stations in New Jersey.

These old landings, long ago cleared of heavy timber, thus offering sunshine, as compared to the darkness of the neighboring cypress and gum forests, were so full of local species that we at once conceived the idea that the old landings on the east side of the Blackwater would yield their quota of novelties. The contour-sheet showed below South Quay bridge a tempting series, George's Bend, Milk Landing, Cox Landing, Sandy Landing and Cherry Grove; and Wyanoke at a point which, if it were west of the Blackwater, would be in Virginia. At this area along the Blackwater, the boundary between Virginia and North Carolina suffers what the geologist would call a nonconformity or perhaps a fault. From below False Cape, on the Atlantic coast, westward to the Blackwater the boundary line is at latitude approximately 36° 48', but from the Alleghenies eastward to the Blackwater it is nearer 36° 46'. We were told that when the early boundary surveyors came from the west and from the east in two parties they failed by more than half-a-mile to meet at the Blackwater and their miscalculation is still sacred.

When, in 1936, I first approached western Nansemond I had left Long at home to make up sleep and with Carroll Williams

⁵ On some of our earlier labels we mistook Smith's Ferry on the Nottoway for Cobb's Wharf on the Blackwater. No plants of critical importance are involved, since most of them share the two adjacent localities.

crossed the bridge at South Quay from Southampton County. I hoped, somewhat blindly, to find a continuation southward of the white-sandy pine barrens which occur south of Zuni (farther up the Blackwater). As I then wrote, "Expressing my hopes to the drawtender, I received the reassuring reply, accompanied by a general sweep of his arm toward Nansemond County: 'Thar's a powerful lot of right smart sand over thar'."⁶ We consequently took the firm road southeastward to Factory Hill, thence to Somerton, and on many subsequent days this route and its arteries have led us through southwestern Nansemond. It would not serve, however, if we were to get to the old landings on the Blackwater. We had formerly let the wheels of the car make our decision for us and they had automatically followed the hard road. Now, putting our own minds to the task, it was clear from the contour-sheet that between the Factory Hill road and the river there are no good roads; the area has a loose mesh of dotted lines indicating only "poor roads" and paths, and much of the region is uncleared. Following the first "poor road" southward from east of the bridge, we soon found ourselves in loose white sand, the road crossing deeply drowned and loosened or floating corduroys over the rain-swollen branches, so that Long and I had to get out and, standing in deep water, hold floating logs at each end of the submerged bridge while Leonard "bucked" the bridge, the water often flooding the body of the car. Only a driver with Leonard's skill would attempt such a road, but through two years now he has not balked, except when, trying a swollen branch and finding the water nearly up to our hips, we have concurred in his decision not to cross.

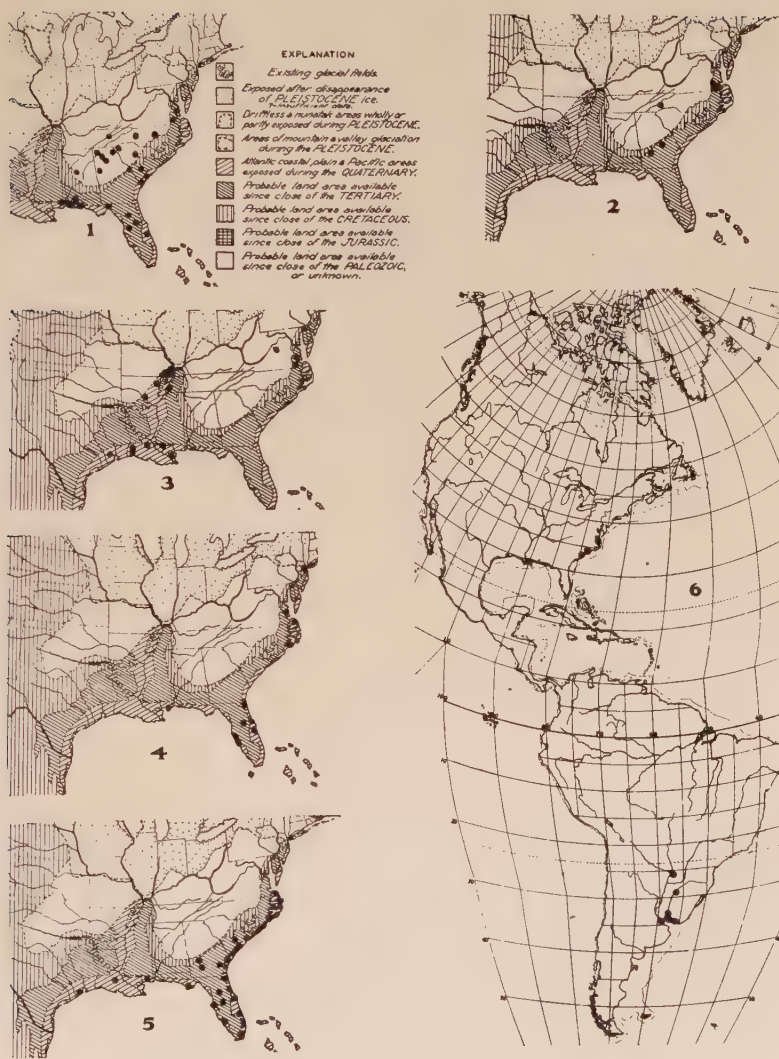
We did not reach any of the landings on the Blackwater that afternoon. The familiar black clouds were assembling in the north and west, ominous thunder was increasing and we, obviously, must get out of this "poor road" before the next cloud-burst. But the continuous white sand, with forest dominated by Catesby's oak, *Quercus laevis*, and by *Q. cinerea*, with long-leaf pine (*Pinus palustris*) quite evident, with *Carphephorus bellidifolius*, *Scleria nitida* Willd. and other pine-barren specialties everywhere, it was obvious that at last and at the last moment of our last day of the June trip we had unwittingly

⁶ RHODORA, xxxix. 360 (1937).

stumbled upon the "powerful lot of right smart sand" which we had been missing for four years. The pine barrens of southwestern Nansemond occupy more than 12 square miles and they could not be investigated until the July trip.

On our July trip (12-28) old problems also had to be looked into. In 1936, on the bottomland of the Nottoway at Cypress Bridge, we got two small individuals which were not quite typical of *Lysimachia radicans* Hook., primarily of the Mississippi basin. We needed material collected through the season and showing all variations. So, on July 17 we went to Cypress Bridge to start a series of monthly inspections of the plant. At the original station freshets had apparently wiped it out, but at the western end of the bridge the plant, in flower, was abundant about cold spring-heads, thence extending far out into the submerged borders of the bottomland. Collections then made, with others up to late autumn, show it to be good *L. radicans* (MAP 3), with considerable leaf-variation, but the plant, which fruits in the Mississippi basin, was here all sterile, whether because too thoroughly drowned or because of its efficient vegetative reproduction we cannot say. Another year, if flowering freely above high-water mark, it may produce fruit. Although *L. radicans* (*Steironema radicans*) occurs in Virginia, I am unable to locate any specimens from other Atlantic states. Its chief development is along the lower Mississippi Valley. This characteristic isolation in Virginia is one which no longer surprises us. With it was a *Galium* which puzzled us. Its fruit and foliage-form were those of *G. obtusum* Bigel., a species ordinarily with whorls of 4 leaves. The Cypress Bridge plant was producing 5 and 6 leaves at the primary and some secondary nodes. This was hardly regular, but flowering material, collected in June, 1940, shows the corollas of *G. obtusum*; we will leave it at that.

For some years we had looked suspiciously at the group of *Rhynchospora cephalantha* Gray and *R. microcephala* Britton. The latter is common in peaty soils of southeastern Virginia, the former rare and confined to sphagnum bogs. But that is not all. A third plant, also rare, somewhat like *R. microcephala* but clearly different, had been found; and in drowned peaty hollows and margins of pools there is a fourth, very much coarser than any of the others. It was now blooming and we made a point



MAP 1, Range of *TETRAGONOTHECA HELIANTHOIDES*; 2, of *ISOËTES ENGELMANNI* var. *CAROLINIANA*; 3, of *LYSIMACHIA RADICANS*; 4, of *AMMANNIA KOEHNEI*; 5, of *JUNCUS MEGACEPHALUS*; 6, bicentric Range of *LILAEOPSIS CAROLINENSIS*.

of securing it, with the hope that its anthers might give good characters. Since my student, Miss Shirley Gale, had for two years been closely studying and monographing *Rhynchospora*

in North America, I asked her help on this problem. Our results will be included in Part II.

One rainy and dreary morning (the 19th), disliking to spend the day, when identities of plants are so disguised by mist and loads of rain-drops, upon an open habitat, we reasoned: since we are bound to get soaking wet and it is a dismal day, why not tackle the Great Dismal Swamp? Accordingly, in the afternoon, at the lumber camp of the Camp Lumber Co., southeast of Suffolk, we followed the lumber-road into the Swamp. As we already knew, the forest and its flora are essentially those of many large flooded swamps and pocosins or dismals in southern Virginia. However, *Ilex coriacea* (Pursh) Chapm., which we had met nowhere else, is there, and we were particularly pleased to make its acquaintance and to see how really different it is from *I. glabra*. In October the contrast became emphasized, for, whereas *I. glabra* retains its hard drupes through the winter and is used as a Christmas green, the drupes of *I. coriacea* in October were soft and pulpy and most of them had dropped. Only by long search could we find any branchlets with drupes still intact. A smooth-leaved *Persea* interested us and I had a vain hope that we had at last found *P. Borbonia*, but it is not that; in outline the leaf is similar to that of the pubescent *P. palustris* (Raf.) Sarg. Later in the season we secured it also in wet depressions of the pine barrens of western Nansemond. Its identification must await further study, for the material of the group from most American herbaria is now buried in Holland, where, long before the war, it was sent on loan.

On our second trip to the region of Taylor's Millpond we returned to Fontaine Creek, where the bottomland woods are near the northern limits of some species. We were quite unprepared to find them the extreme southern limit of any range but in one recently cut area there was a good colony of the northern *Lactuca canadensis* var. *longifolia* (Michx.) Farwell,⁷ heretofore known only farther north or inland, from Quebec to Saskatchewan, south to New England, New York, the upland of North Carolina, Ohio, Indiana, Missouri, etc.

We had found, when we had only a fragment of the day free for botanizing, that the waste places, dumps, neglected road-

⁷ See Fernald, RHODORA, xl. 481 (1938).

sides and the railroad yards (especially that of the Norfolk and Western at the eastern margin of Petersburg) supplied some novel weeds; furthermore some weeds, rare or scanty in 1938 or 1939, like *Potentilla recta* and *Chondrilla juncea*, have in 1940 become very abundant and aggressive. So, on the 21st, having only the forenoon clear, we set out to weed the town. Botanically, if not economically, the operation was successful and we brought back a large series of weedy Euphorbias, including the southern *Euphorbia prostrata* Ait., which had been known in the state only through collections of Grimes's. *Acalypha ostryaeifolia*, very distinct and almost handsome, abounds on steep weedy slopes near the Appomattox but along the Norfolk and Western, where it might have been indigenous, but too doubtfully so, since, except for a somewhat shaky record for New Jersey, it is otherwise known in the Atlantic States, from South Carolina southward, primarily as a weed. On one open and weedy patch there was a tall amaranth, with prolonged but much interrupted spiciform inflorescences. This proves to be *Amaranthus Torreyi* (Gray) Benth., a western prairie type, a species which may soon abound about Petersburg.

Our earliest Virginia work, from 1933 to 1935, centered on Virginia Beach. We then became very cognizant of the strong contrast between the flora of the open shore and marshes from Cape Henry to Sand Bridge and the western side of Back Bay and that of the eastern shore of Back Bay and the islands (Knott's Island and Cedar Island, the only ones formerly visited). Along the mainland shore or on the west side of Back Bay several species occur which we did not see on the islands and the eastern shore of the Bay. Conversely, there are many species on the islands or at False Cape which we have never found on the west side of the Bay. Thus, along the shore or on the sands between Cape Henry and the inner shore near Munden the following, among others, are characteristic, yet we have never got them from the outer shore of the Bay or from the islands: *Aristida lanosa*, *Cyperus retrorsus* var. *Nashii* (Britton) Fern. & Griseb., *C. erythrorhizos*, *Fuirena pumila* Torr., *Xyris difformis*, *Tillandsia usneoides* (on trees), *Sesuvium maritimum*, *Nelumbo* and *Heliotropium curassavicum*. On False Cape or Cedar Island the following, unknown on the mainland side of the Bay, we knew

to be characteristic: the austral *Phalaris caroliniana* Walt. and *Eleocharis albida*; the boreal *E. halophila* Fern. & Brackett; and *E. Lindheimeri* (Clarke) Svenson at the only known coastal area east of Texas; the southern *Dichromena colorata* and *Juncus megacephalus*; and the remarkable *Iresine rhizomatosa* of the Mississippi basin and southwestward but with another isolated area on the Potomac; and *Ampelopsis arborea* and *Lippia nodiflora*. These contrasts indicated that the islands of Back Bay need much more exploration by competent botanists. Consequently, when that energetic and successful champion of conservation of the flora of Cape Henry, Miss Sally Ryan, invited us to her home at Virginia Beach and asked me to suggest some area where we could do worth-while botanizing, I suggested securing a motor-boat and getting out to the islands.

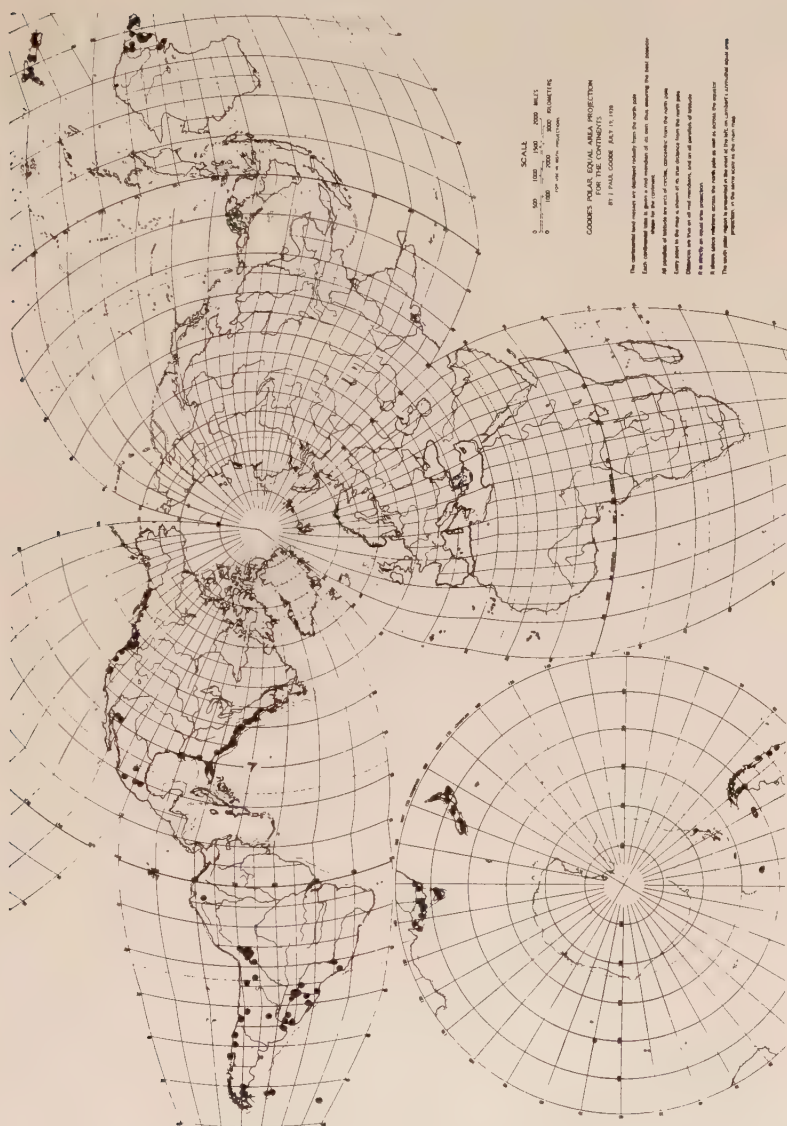
On the 22nd, therefore, with Miss Ryan's co-worker on conservation, Miss Mary Leigh, my correspondent for some years, and with Mr. George Mason, Director of the Mariners' Museum at Newport News, we drove to the headquarters (C. C. C. camp) of the National Wildlife Refuge at Pungo. The friendly Manager of the Refuge, Mr. Harry A. Bailey, with his associate, Mr. Ewell, a native of the region, drove us down the beach to the developing headquarters of the Refuge, back of and below Little Island Life Saving Station. Thence we were taken in one of the splendid launches of the Biological Survey by Mr. Ewell to the southeastern corner of Long Island, and he waited patiently among the mosquitoes and flies for some hours while we waded along the marshy margin of the Island. Before we had left the plank-walk leading from the landing at the outer border of the marsh we wanted to jump in, to get the rare plants which were in sight. *Najas guadalupensis* and *Anacharis occidentalis*, flecked with *Lemna perpusilla*, filled the water; *Ammannia Koehnei*, MAP 4 (represented in our larger herbaria from only a few stations between Florida and the Hackensack Marshes), was in solid phalanx, and the white and lilac-tinged flowers of the sub-tropical *Bacopa Monnieria* and the panicles of the local marsh grass, *Diplachne maritima* Bicknell, were conspicuous. We waded at the inner margin of the marsh (in fresh water, we were assured, but with a remarkable number of halophytes, like *Scirpus robustus*, *Spartina cynosuroides* and *Lythrum lineare*)

through shoulder-high and taller vegetation. Progress was slow and difficult but we wanted to go slowly in order to see the plants. Amidst the commoner marsh species there were limited colonies of *Dichromena colorata* and of *Juncus megacephalus* (MAP 5) which we had known in Virginia only at False Cape, the latter following the coastal marshes northward, but in the southern half of its range venturing inland, and unmistakable *Verbena scabra* Vahl, a tropical species which we already knew as an excessively local plant in eastern Virginia. At the border of the marsh, beneath the bushes, *Carex Frankii*, an inland species, had reached the coast, although we had never before met it in Princess Anne County; and farther back, just as on Cedar Island, the Mississippi basin *Iresine rhizomatosa* abounded, and *Physalis angulata*, the first we have had in the Gray Herbarium from north of North Carolina, was occasional. We were approaching the small pond back of the marsh and south of the landing, and Mr. Ewell was in sight, coming to say that it was time to leave, for it was important to get back to Little Island in order to take advantage of low tide in driving up the beach. It was necessary, however, to see what was in the pond. It is fortunate that we did so, for this pool contains a continuous carpet of closely interlocked plants of *Lilaeopsis carolinensis* Coult. & Rose (MAP 6). *Lilaeopsis*, a very primitive genus of the *Umbelliferae*, without true leaves but with clavate or broadened and jointed stems functioning as leaves, has one species on tidal shores of Atlantic North America from Florida to Nova Scotia, another on the Pacific coast from California to British Columbia, others (very local) in Arizona and Mexico and the others (except *L. carolinensis*) local species of various parts of South America (tidal shores to more than 4000 m. in the Andes), Tasmania, New Zealand and Australia. The antiquity of the genus (MAP 7) is evident; and at the last moment on Long Island we were pulling in mats of *L. carolinensis*. Described in 1897 from a single collection from eastern North Carolina (presumably near Wilmington), it is now known from three other stations in North America: Horry Beach, South Carolina; New Orleans; and our new station on Long Island. But along La Plata River in Argentina, Uruguay and Paraguay it is evidently frequent. *L. carolinensis* is clearly a bicentric species, with one area in warm-temperate

eastern South America, there reaching its southern limit near lat. 35° , the other area in warm-temperate eastern North America, with the northern limit near lat. 36° . Such ranges will find amplification when we consider other plants of fresh tidal waters and marshes collected in the late summer and autumn of 1939.

We were deeply grateful to Miss Ryan for having arranged so successful an expedition and to all our new friends who had helped her carry it through; but she and Miss Leigh, with the remarkable enthusiasm which they share, were not through for the day. When we reached headquarters near Pungo, although we had already had a long day and were soaking-wet, they offered to show us some of the specialties; but, since none of the party had ever seen *Asarum arifolium*, which Griscom and I had found in May, 1935, in woods near Creeds, we went in search of that. The station seems to have gone with its protecting forest. After that the ladies introduced us to their station for *Stewartia Malachodendron* and took us to other interesting plants. When, after dark, we brought up at a fashionable restaurant for late dinner, the well-groomed official haughtily looked us over and shook his head. After demonstration that we were more respectable than our bedraggled clothes, we were ushered into a secluded room and allowed to eat where the sporting fraternity of Virginia Beach would not be shocked. Long and I were dead-tired when we reached the Ryan home; the ladies could have stayed up all night, going over the specimens!

Next morning we drove, not too far away, in the vicinity of the Beach, for Long and I had to catch a noon train at Norfolk. Having heard that the area of sphagnous peat south of the Rifle Range was greatly altered and that deep ditching had obliterated the only known station in the world for the unique cleistogamous *Hypoxis Longii* Fernald in RHODORA, xxxvii. 410, pl. 393 (1935), both Long and I, as responsible for its original recognition, were anxious to know its fate. Since the discovery of the plant the Rifle Range has been greatly altered and, whereas we used to go and come at will in the region to the south, the area is now fenced off and with military guard, for not only rifle-practice but mortar-firing and other military training have greatly increased. The Commandant, as soon as I explained my errand,



MAP 7, Range of Genus LILAEOPSIS.

most kindly let us pass, with the precaution to be back before mortar-firing; and in five minutes we were standing in the original station, with *Hypoxis Longii* seemingly as prosperous as ever.

This species, descended from the ancient stock (of subgenus *Ianthe*) which left representatives in New Zealand, Australia, Tasmania and South Africa and *H. Longii* and *H. sessilis* L. or their progenitors in eastern America, has not given up merely because of temporary change. It is, however, too near the military developments which are rapidly moving toward it and it is fortunate that it was discovered and collected when it was.

We then went to Dam Neck, where in May, 1935, Griscom and I had found a single plant of the other American member of *Hypoxis*, subg. *Ianthe* (*H. sessilis*), hoping that the cattle, which then infested its habitat, had moved on. The cattle were not there but, so far as we could determine after an hour of back-breaking search, neither is *Hypoxis sessilis*. As a last episode, Miss Ryan took us to her station for *Osmanthus americanus* (L.) B. & H., a southern tree isolated at northern stations back of Cape Henry. It was a joy to see it with our own eyes, but there was hardly time to drive to another station for it, discovered by Miss Leigh.

On the way to and from Norfolk on the through train we had caught flashes which we took for *Sarracenia flava* and for *Zigadenus glaberrimus*. These meant possible good bogs. So, on the 24th we drove down the line (parallel with the Norfolk and Western) to investigate them. For the most part they are meagre remnants with nothing notable; but 2 to 2½ miles west of Waverly there is a rather nice and very typical patch of swampy woods, with *Zigadenus glaberrimus* in such profusion as we had never imagined. Returning to the car, which was parked at a minor cross-road, we were surprised to find the ditch full of *Typha truxillensis* HBK. (MAP 8), the tropical species reaching the shores of Back Bay and discussed by me in 1935. The Back Bay stations were the first known north of Florida, and the *Typha* there extends north to latitude 36° 40'. The station in Sussex County is 65 miles inland and in latitude 37° 2'. Another plant at this crossing was new to us. Occupying the railroad embankment, so suspiciously close to a farm-gate as to suggest that it had started from seed brought in freight delivered there, it has become an extensive colony. It proves to be *Froelichia gracilis* (Hook.) Moq., native from Iowa to Arkansas and southward. We were quite excited over it, but next day we

found it also in the Norfolk and Western yard at Petersburg, and in 1940 in similar places at Richmond.

The sphagnum bogs along the Norfolk and Western mostly proving of no interest and we being much overheated after some miles of tramping along the tracks, we decided to start home and, if opportunity presented itself, to do a little exploring. We had many times noticed a road leading north from Disputanta to Newville and since exploration and relatively cool riding were in order we took that. Yellow-rayed composites were becoming frequent and we had more than once chided each other for calling a halt at colony after colony of familiar species of *Coreopsis* or *Rudbeckia*. At the border of pine and oak woods, however, something failed to "register", so I risked being laughed at and called to Leonard to stop; there was a strange yellow composite in the woods. Although we had passed the original spot, there was no need to go back; the border of the woods for a mile or two was full of the strange plant. Only a few heads were expanded and we were not sure of the genus; in August the woods-border was brilliant with the fully developed heads and then we enjoyed the real beauty and distinction of the plant. We even guessed it to be a strange *Heliopsis*, but it proves to be *Rudbeckia Heliopsidis* Torr. & Gray (MAP 10), described, with two varieties, "a. almost glabrous" etc., and "β. . . . pubescent", from "Pine woods, &c. a. Columbus, Georgia, Dr. Boykin! β. Cherokee country of Alabama, in wet places, Mr. Buckley!" It has not been found in other regions and most of our herbaria lack the species. They will now be well supplied, and roots of the species wintered successfully in the Harvard Botanic Garden, whence seed can later be sent out. Furthermore, the Disputanta area has both the glabrous and the pubescent forms. Carl Mohr in his *Plant Life of Alabama* says of it "Local and rare" and found only in the "Mountain region" of Cherokee, Lee and Dekalb Counties. This disruption of range inevitably calls to mind the Cherokee Gentian, *Gentiana cherokeensis* (W. P. Lemmon) Fernald in RHODORA, xli. 487 and 552, map 14 (1939), which is known only from northwestern Georgia and from wet pineland of Sussex County, Virginia. These ranges are also suggested by *Isoetes Engelmani* var. *caroliniana* (MAP 2), already discussed, and by one of the very rarest of Trilliums, *Trillium lanceolatum*



MAP 8, Range of *TYPHA TRUXILLENsis*; 9, of *CYPERUS HASPAN* var. *AMERICANUS*.

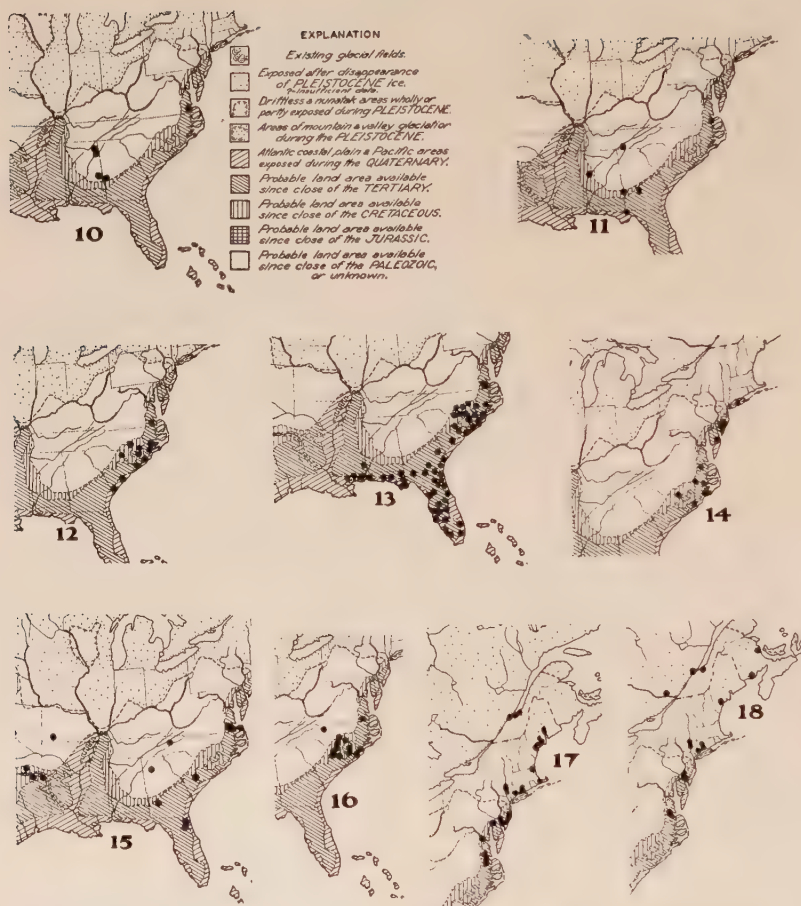
Boykin (MAP 11), which was collected in late April, 1926, by Professor Paul A. Warren, in the Great Dismal Swamp, when a party from the College of William and Mary went from Wallace-ton to Lake Drummond. Up to 4 P. M. we had considered the day a "flop"; at bed-time we regarded it with complete satisfaction!

The next day was really a "flop". Aiming to cross the James from Scotland to Jamestown and to investigate back roads in that region, we got to a point between Surry Courthouse and the Scotland Ferry; then the car stalled. Towed back to Surry

Courthouse for repairs, we spent the day there. After lunch there was little to do except to wait patiently for the repairs and to look over the weeds of back yards and roadsides. Two weeds, *Potentilla intermedia* and *Rumex Acetosella* var. *integrifolia* Wallr., we had never met in the state, but on the whole the pickings were few. Naturally the people of the county-seat were curious about two strangers who constantly looked down and suddenly stooped at roadsides or in waste lots and grabbed at something; and when Long ventured to clean the mosses off trees and basements in the court-house precincts, the admiration and wonder increased. Upon his explaining the interest of such studies he received the judicial reply: "Well, a grass is a grass, a moss is a moss; that's all we know about it". Forty-eight hours later, in a more humble locality, we stimulated a quite different comment.

Next day, reasoning that the pine barrens of western Nansemond County must by this time have warmed up and come well into bloom, we went there. Taking the first sandy road toward the Blackwater River, below South Quay bridge, we reached George's Bend. Wishing to park our car in the yard of the isolated house above the river, we at first met some dissent from the owner; but, as soon as he knew our errand and that we were not after his fish, he and his alert wife proved most cordial and valuable new friends, for he was Mr. T. S. Jones, long employed in surveying, and it was he who had located the colonial landings and worked out their history in the preparation of the contour-sheet of 1918. Mr. and Mrs. Jones were so hospitable and so full of lore about the Blackwater valley and its history that we almost forgot that we came to botanize. However, going down to the river and following south toward the old (or original) South Quay, we found ourselves in such a forest of *Styrax americana* as we had never imagined. Along the Nottoway, below Point Beach, we had been amazed at the profusion and size of the small trees, but the colony between George's Bend and old South Quay is scarcely to be excelled; and *Asimina parviflora* (Michx.) Dunal, elsewhere scattered, was here really abundant.

Returning to the main "poor road" southeastward, we next left it to go down to Milk Landing, but we did not stay long, for



MAP 10, Range of *RUDBECKIA HELIOPSIDIS*; 11, of *TRILLIUM LANCEOLATUM*; 12, of *VACCINIUM CRASSIFOLIUM*; 13, of *CALOPOGON PALLIDUS*; 14, of *RHYNCHOSPORA PALLIDA*; 15, of *TRIODIA CHAPMANI*; 16, of *ZENOBIA PULVERULENTA*; 17, of *ERIOCAULON PARKERI*; 18, of *ELATINE AMERICANA* (omitting far-inland records).

my two companions promptly got into a nest of "seed ticks", literally thousands and thousands of the tiny vermin. In a few seconds they were peppered, resembling old-fashioned pictures of the worst eczema-cases, with the minute irritating specks. An hour off was necessary for them partially to clean up; and Milk Landing was carefully avoided for two months and became the object of uncomplimentary remarks whenever we drove by

the road. So, leaving that infested area, we went on and took the partially overgrown road leading southward, parallel with the river. We soon came to an overflowed branch, too much swollen to cross, and parking the car off the narrow road, we went on afoot. In five minutes we were in such a pine barren as we had not imagined. In fact, we did not get to the road leading down to Cox Landing that afternoon. The daily thunder-storm was upon us, with vivid lightning and claps of thunder which could mean only that lightning had struck near-by. Finally, returning to the car, we saw a tall pine shattered within ten feet of the parked car; that meant that it was time to start home. For three days we explored this area and I shall make no effort to follow exact chronology in enumerating the specialties. Sharing the damp sands and peats with *Pyxidanthera* were solid carpets of a trailing evergreen *Vaccinium*, somewhat suggesting cranberries but with axillary young fruits. This could be nothing but *Vaccinium crassifolium* Andr. (MAP 12), a very local Carolina species heretofore unknown north of central-eastern North Carolina. There are many square miles of it here; we found it to the east, nearly over to Marsh Hill School; and in May, 1940, stretched its range northward into Isle of Wight County. That was a good start! Practically all open and damp areas were full of *Juncus abortivus* Chapm. and *Rhynchospora distans* (Michx.) Vahl, both found by us in 1936, growing together in one small patch in the Isle of Wight barrens south of Zuni; the sands were a seemingly continuous carpet of *Xyris flexuosa* (arenicola); and *Bulbostylis ciliatifolius* and *Tradescantia rosea* Vent. var. *graminea* (Small) Anders. & Woodson, along with *Panicum mutabile* Scribn. & Sm., were in the drier sands. At one point Long detected tiny seedlings of a plant which resembled *Polygonella articulata*; but, since we had never found that species (common farther north) in Virginia, we fondly hoped that in October it would prove to be some rare southern species. *Seymeria cassioides* (Walt.) Blake, also of the Isle of Wight barrens, was there, as were the two *Sarracenias*, along with *Rhexia ciliosa*. In the bushy hollows, among the common but always beautiful *Lyonia lucida*, *Leucothoe axillaris*, *Smilax laurifolia*, *Cyrilla racemiflora* and other characteristic austral shrubs, there was one colony of a tall *Amelanchier* with most of

the leaves entire. Unfortunately, it was too late for fruit and in April, May and June of 1940 we could find neither flowers nor fruit. Here, too, was the glabrous-leaved *Persea* which we had seen in the Great Dismal Swamp. *Chamaecyparis thyoides* often filled the hollows and in many depressions there was a characteristic *Hamamelis*, with twigs quite pubescent, the relatively small leaves heavily felted and mostly with a silvery tone beneath. This greatly interested us and we followed up the colonies until, in October, we had the newly expanding flowers. It is *H. virginiana* var. *parvifolia* Nutt., originally described from the mountains of Pennsylvania and from Louisiana. Long and I used to get it in Nova Scotia, but south of New England it is apparently highly localized. *Cleistes divaricata* (L.) Ames is scattered in the thickets, but the great prize in the orchids was *Calopogon pallidus* Chapm. (MAP 13), a beautiful little species new to the "Manual range"; but already known within 90 miles of Virginia. The map, generously supplied me by Dr. Donovan S. Correll, clearly brings out the gap between the northeastern stations in North Carolina and the isolated area in southeastern Virginia. So many southern Coastal Plain species extend northward to the Neuse or occasionally to Pamlico Sound and then vanish, to reappear again in southeastern Virginia, that we can only conclude that northeastern North Carolina really lacks them or that its assumed sterility has prevented proper search for them. My North Carolina friends tell me that the former is the right interpretation. So much for the general area of pine barrens.

Wishing to get to Sandy Landing, Cherry Grove and Wyanoke, but hoping to find a road with fewer overflowed branches, we drove one day down the Factory Hill road and took a side road southwestward below Marsh Hill School. Two years earlier, with a driver whose bent was not exploration, we had started out this route but had soon turned back because the road was so bad. Now it seemed almost a boulevard. Passing the clearings and farms, we soon came into pineland and, reaching Big Branch, we saw that it was the deepest one yet. I tested the crossing until the water was nearly up to my hips, so this route to Sandy Landing would not do in the rainy season. Backing up from Big Branch to turn, we suddenly realized that, intent upon map

and road, we had just passed a wonderful sphagnous savannah-like swale, such as we had never before seen in Virginia. Parking near the house of the colored farmer, Tom Hunter, who, with his brother on the clearing beyond, has the satisfaction of being without neighbors for some miles to the north or south, and for more than a mile to the west, east and northeast, we proceeded to explore. Much of the original bog had been cleared and turned into corn, beans and peanuts, but there were remnants which showed what a wonderful spot it originally was and, to a slight extent, still is. Melanthaceous and more typically liliaceous species vied with orchids and unusual sedges for possession. The place was brilliant with the purple racemes of fruiting *Tofieldia racemosa*. Dozens of leaf-green fruiting racemes of *Amianthium Muscaetoxicum* could easily be counted; and a regular army of creamy-white panicles of *Zigadenus glaberrimus*, with purple panicles of *Melanthium virginicum*, was at the upper border of the area. Orange-flowered *Habenaria cristata* and white *H. blephariglottis*, by thousands and larger than we usually see, were splendidly flowering; and with them there was a single \times *H. Canbyi*, their hybrid, heretofore unknown from Virginia. Beyond the *Zigadenus* patch we suddenly halted, each of us excitedly calling to the other to look, for there were great erect orange-red flowers of a lily. Obviously related to the more southern *Lilium Catesbaei*, it is larger in all parts, with broader and less recurving petals, broader and blunter leaves and other characters which set it apart, and in October, when we collected ripe fruit, we found that it has distinctive capsules and seeds. It is undescribed but will be fully discussed and illustrated (PLATE 632) in Part II. Seeds have been given to several growers of lilies and the seedlings at the Harvard Botanic Garden are prospering. In the wetter areas among nice associates, *Lachnocaulon anceps* was thriving; and, scattered over the bog, there were many choice sedges. Space will be taken to mention only two. *Scleria minor* (Britton) W. Stone, always a very satisfying species of wet sphagnum, abounded; and there were gigantic clumps (up to a foot in diameter and 3½ feet high) of *Rhynchospora pallida* (MAP 14), the tallest specimens ever collected and the first evidence of this truly rare species with bulbous-based culms between Beaufort County, North Carolina, and its local

station in Delaware. We had, indeed, been having several "peppy" half-hours.

Before we quit, Tom Hunter, the colored owner, returned from Franklin. Already informed by his flock of children as to our visit, he greeted us: "I'm glad that someone who knows plants has come in here; there are lots of them here that I don't know about". So I opened my box, which happened to have fruiting *Persea* at the top. "Ah! Red Bay!" was the immediate response, followed by the question, "Have you found the Polypody that grows up in the trees?" Two days before, at Surry Courthouse the best we could draw from the rulers of the land was, "Well, a grass is a grass, a moss is a moss; that's all we know about it"!

In August (17-30) we first went to the wet pineland at Colliers' Siding, south of Petersburg, where one of the new *Rhynchosporas* abounds, along with *Rhynchospora perplexa* Britton, hoping to find *Manisuris* which *ought* to be there. It certainly is not there! But in crossing the tracks of the Atlantic Coast Line we got one tiny individual of a rubiaceous plant new to us. Eye-straining search among the weeds for half-an-hour showed no more. We, accordingly, accurately divided the tiny plant, scattered the ripe seeds and recorded the tropical weed, *Richardia scabra* L., as having barely reached Virginia. We then went to Disputanta to get fully flowering material of *Rudbeckia Heliopsisidis*. While doing so we found the northernmost and really quite extensive station for *Lilium Michauxii* Poir. Then, having an hour left before dark, we went exploring, this time to Indian Point on the James. There we found very rich slopes which, in spring, must be full of interest; and one species in old fruit, *Viola striata*, was definitely an addition to the Coastal Plain flora. It belongs primarily in the richer interior.

Next day, exploring and somewhat lost on back roads between Stony Creek and Emporia we were approaching Double Bridge on the Nottoway when *Helianthus decapetalus*, which we had not had on the Coastal Plain, caught our attention. Stopping to collect it we found, just below the fall-line, a rich assemblage of upland types. I had long been worried because in the Gray Herbarium there is an old specimen, called *Sida Elliottii*, without further data than "Petersburg, Va., *Tuomey*". In our four seasons of botanizing, with Petersburg often a center, we had never

seen it, but, in pine woods slightly below the fall-line there was a large colony of the plant in fine flower. Later in the season, above Carey's Bridge, we found the plant very abundant, also in pine woods. Now that we have a full series in flower and in mature fruit, it shows many characters, including conspicuous ones in the carpels. It is an undescribed species (PLATES 638 and 639) and not at all *S. Elliottii*. Slightly above the bridge the "fall-line" is here conspicuous because of the ledges displayed, with a steep cliff at the fall of the river. On these ledges, the common plants both of the Piedmont and of the Coastal Plain, *Woodsia obtusa*, *Panicum laxiflorum*, etc. were abundant, but it was a real surprise to find, within a few rods of the inner margin of the Coastal Plain, the upland *Cheilanthes lanosa*. We have not yet succeeded in coaxing it over the fall-line. While waiting for the party to assemble I crossed the bridge from Sussex into Greensville County. There, at the end of the bridge (north of Purdy), was a large oak with heavily fruiting branches. In October, when the fruit was ripe, the profusion of acorns upon it was most striking. Yet it proves to be *Quercus Bushii* Sargent, a reputed hybrid of *Q. marilandica* and *Q. velutina*, heretofore recorded only from Georgia and Florida to Oklahoma and Mississippi.

When we returned to Cobb's Wharf for the later stage of *Panicum cryptanthum*, also getting at the tidal shore *Echinochloa Walteri*, forma *laevigata* (*E. longearistata* Nash), new to Virginia, we passed by an extensive and very weedy peanut field. In joke I said, "Let's get some fancy weed out of this field". Leonard stopped the car, and pronto! there was an acre or more of gigantic *Richardia scabra* overtopping the peanut plants, the tropical weed of which we had scrupulously divided a single starved plant a few days earlier! Another day, in Nansemond County, stopping at the border of the road, the first plant we saw was *Richardia*. It has more than "barely" reached Virginia; but something had spoiled the charm. Repeatedly thereafter I tried the formula, "Let's get some fancy weed out of this field", but it never worked again.

Returning to the white sands south of Sebrell we found the clearings and open woods full of critical species of grasses and sedges, but our chief interest centered on *Triodia Chapmani*

(Small) Bush (MAP 15). Ever since Griscom and I found it back of Cape Henry, we had been watching it. We never have any question about its identity and now we noticed that this plant of pine barren and dry sands has conspicuous pulvini as compared with those of *T. flava*. Our experiences lead us to the conclusion that it is a distinct species, which comes north into southeastern Virginia.

Returning to Tom Hunter's, via the road south of Marsh Hill School, where, in the pineland, fruiting plants of *Cleistes divaricata* were scattered, we found the sphagnous swale much changed in appearance. The brilliant display of color was gone, but the large purple flowers of *Chelone Cuthbertii* were very handsome. Still prettier, from our prejudiced viewpoint, was tiny blue-flowered *Burmattia biflora*, its local range now extended eastward into Nansemond County. The open springy spots had carpets of *Utricularia*, especially *U. juncea* and its tiny imitator, *U. virgatula*. I think I do him no injustice when I state that Long is inclined to look upon them as possible phases of one species, comparable with *U. subulata* and its forma *cleistogama* (*U. cleistogama*). Other such oozy openings were the home of *Psilocarya scirpoides*, var. *Grimesii* Fernald & Griscom in RHODORA, xxxvii. 154, pl. 344, figs. 1 and 2 (1935). The plants were of all sizes, from starved individuals with few spikelets up to relative giants, 6 dm. high.

In the more typical pine-barren area we were delighted with several plants which in July had been unrecognizable. *Eupatorium tortifolium* Chapm. had not been recorded from north of South Carolina, and the range of *Andropogon virginicus* var. *glaucus* Hackel (*A. capillipes* Nash) was extended north from North Carolina. With it was *A. virginicus* var. *tetrastachyus* (Ell.) Hackel (*A. tetrastachyus* Ell.) which Griscom and I had found at Cape Henry. East of Sandy Landing there were many plants, resembling *Carphephorus tomentosus* (Michx.) Torr. & Gray but much smoother and with glabrous rosette-leaves. These could be only the plant described by Elliott from South Carolina as *Liatris Walteri* but not recently recognized, although Ravenel correctly identified material from Santee Canal and M. A. Curtis so named specimens from Wilmington, North Carolina. It is a fine addition to the "Manual range" and will

be further considered in Part II. Another addition to the flora of Virginia, one which tremendously pleased us, is *Zenobia pulverulenta*, a very local species heretofore known only in the Carolinas (MAP 16).⁸ In many wet thickets and *Chamaecyparis* swamps, particularly from northeast of Cox Landing to below Sandy Landing, it is conspicuous. In 1939, when it was in fruit, we got only the green-leaved shrub, but in June, 1940, when the beautiful milk-white and delicately fragrant large bells were expanded, we found all shades of foliage, from the deepest green to the bluest white, and great diversity in outline and tothing of leaves. These will be discussed in Part II. It is futile, perhaps, to attempt to discriminate among the handsome members of the tribe *Andromedeae*, but at the moment *Zenobia*, when loaded with flowers, ranks about first in our minds.

At last (on the 22nd) we made the crossing to Jamestown Island and the surrounding area. As soon as we reached Back River, opposite Jamestown, our duty became plain. The tidal marshes were becoming rich botanical ground. Close to the landing there *Aeschynomene virginica* was maturing. A year before we had been thrilled by it and now it was a bit exciting; but from now on through October it was seen on practically every tidal shore of the river-systems from the James northward. *Echinochloa colonum* (L.) Link, which we had never before met, was there, and some other species to be noted in Part II. Doing the obvious, we sought out the fresh tidal marshes of Powhatan Creek and, luckily, we arrived before the tide had too much drowned them, though we finally got driven out before we had completed our survey. That, however, is the disadvantage of work on estuaries, and, strangely enough, low tide on rivers a few miles apart may be at quite different hours. This is especially the case on creeks entering rivers with long distances to the open ocean and with sinuous channels, like the James. In September and October, when we specialized on estuaries, it was necessary to learn the hours of low tide on different rivers and at different points upon them; otherwise we should have failed. We got the impression that the favorite

⁸ In the Herbarium of the New York Botanical Garden there is a specimen marked on a copied (not original) label: "High mountains of North Carolina, June, 1868, Wm. M. Canby". This specimen is too doubtful for inclusion in the map.

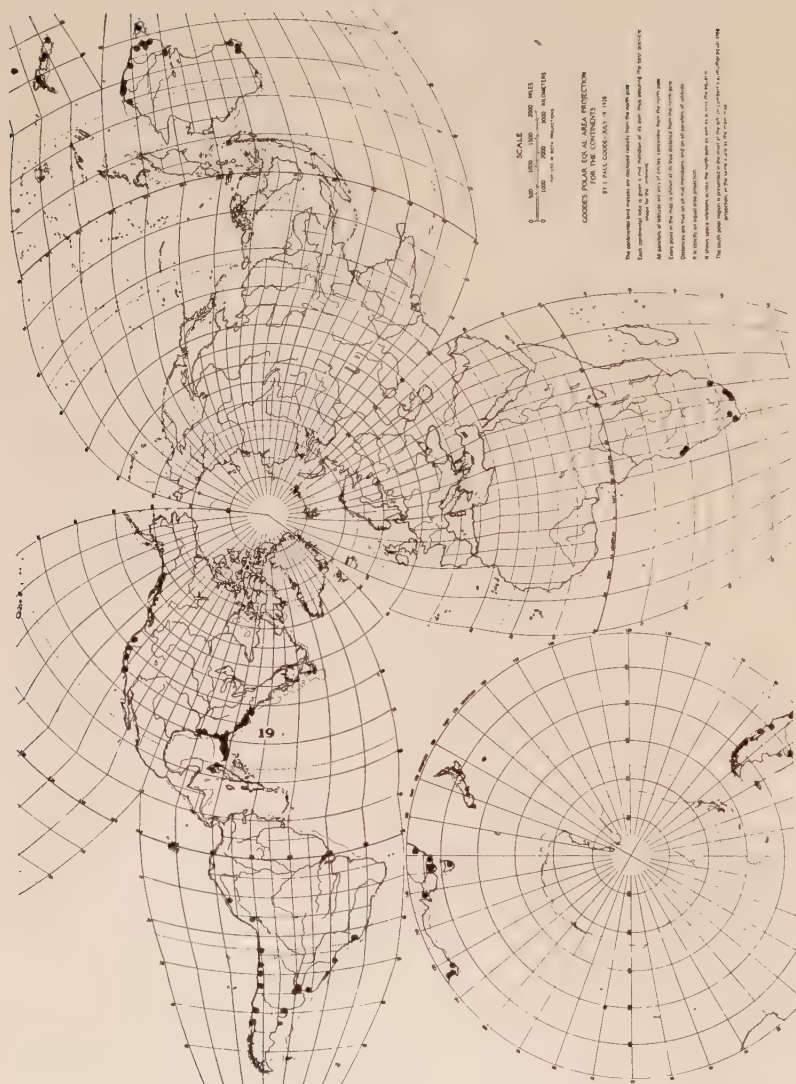
hours for low tide were between 7 and 10 in the evening and 5 and 8 in the morning! But to return to Powhatan Creek, northwest of Jamestown. The most obvious plant as we came to the tidal marsh was *Eryngium aquaticum* and we soon learned to expect it on every tidal marsh. *Cyperus haspan*, var. *americanus* Boeckl. (MAP 9), likewise, tropical and warm-temperate American representative of a pantropical species, was there and on most other such marshes, and so was the giant flaccid-leaved variety of *Rhynchospora macrostachya*. In RHODORA, xli. 533 (1939), I noted the occurrence of the species on the tidal mud of the James and the Chickahominy, whereas in the Great Dismal Swamp and in most regions it is a species of acid peat. The plant of many river-estuaries of Virginia is uniform in its thin and flaccid, greatly elongate leaves and its great stature (up to 1.75 m. high), and Miss Gale finds distinctive characters in the achenes. It will be further discussed in Part II. On the mud at extreme low tide were *Eriocaulon Parkeri* (MAP 17), whose Virginia citizenship has rested only on a collection of Grimes's on the Chickahominy, *Sagittaria subulata* (typical) and *Elatine americana* (MAP 18), the first from south of the estuary of the Delaware. When the incoming tide finally drove us back into the woods, there was *Scirpus fluviatilis* Harper, var. *virginiana* Fernald in RHODORA, xli. 532 (1939), which we had known only south of the James.

Forced out by high tide at Powhatan Creek, we drove westward and finally tried the shore at Wilcox Wharf on the James. The water was pretty high but we were there particularly impressed by a demonstration (discussed in Part II) of the transition from *Panicum agrostoides* to *P. condensum*. But the great prize was a repent plant of the *Commelinaceae*, quite strange to us. It was still very young, not beginning to flower. We were completely puzzled by it, for it did not belong either to *Commelina* or to *Tradescantia*. The spot was, consequently, carefully noted for a visit in September.

Long Island in Back Bay had supplied so many novelties that we wanted to return there. Miss Ryan and Miss Leigh had gone to the mountains; but we arranged with Mr. Bailey at the Pungo camp to get us out to the Island or the islands for the 24th and 25th. We did not then know that the conservation of

wild life involved so much plowing up and planting of the land to foreign crops as we soon discovered that it does—grain for the migrating geese, etc. When we reached headquarters at the appointed time the Manager had gone, expecting to return for us at once. But, as we learned that evening when we dined with Mr. Bailey, something had gone wrong with a tractor and it was impossible to come back for us. So, after deciding that we could not reach Long Island on the 24th, we drove to Munden in the afternoon and, taking roads and lanes out to the west side of Back Bay at every opportunity from there to Nowney Creek, when it was time to quit, accomplished some worthwhile exploration. Open muddy shores were often carpeted by two plants so alike in superficial aspect that we had to look twice to separate them: *Sesuvium maritimum* and *Heliotropium curassavicum*. Water-holes and pools were generally bordered by *Diplachne maritima*. Open flats were carpeted with *Eleocharis parvula*; and occasional colonies of *Triglochin striata* (MAP 19) exceeded in size of plant any we had ever met. This species, in its disrupted range (warm-temperate North and South America, South Africa, Australia and New Zealand), is fairly typical of many species which inhabit the fresh to merely brackish tidal shores in southern Virginia. They will be specially considered in Part III. Shallow pools at the inner border of the marsh were filled by a *Sagittaria* in full flower, often with oblong floating leaf-blades. This was *S. subulata* var. *natans* (Michx.) J. G. Smith, the first from so far north as Virginia, and with it was *Utricularia biflora*, also new to the state. At the inner border of one marsh *Asclepias lanceolata* (typical), also the first known in Virginia, was fruiting. When we were forced to stop collecting we felt that the afternoon had been well spent.

Next morning at the appointed time, 8 o'clock, Messrs. Bailey and Ewell drove us down the beach and the latter soon landed us at the old point on Long Island. From there we worked northward to the tip of the island, then back by a slightly different route to the landing. The water of shallow Back Bay was so very clear that we could see the white sandy bottom only a few feet below, except where *Potamogeton bupleuroides*, *Vallisneria americana* and the other aquatics made solid growth. Immediately upon landing we saw the sky-blue flowers of *Com-*



MAP 19, Range of TRIGLOCHIN STRIATA.

melina diffusa Burm. f., the creeping species which we had got the year before on the bottomlands of Meherrin River. This began the season, for from late July to October the *Commelina*, usually along with its mysterious ally of Wilcox Wharf, was

found to characterize many tidal marshes and shores. Paths and borders of clearings on Long Island were often fringed by *Erigeron bonariensis* L., a tropical weedy species which Griscom, Long and I had once collected as a "casual" in Norfolk County; and one of the sandy fields supported *Diodia teres* var. *hirsutior* Fern. & Grise., which had not been known north of North Carolina.

The marshy flat at the northern end of the Island was most interesting, for it is so characteristically what elsewhere would be called a subsaline marsh (See p. 000). *Polygonum prolificum*, usually of saline soils, and *Spergularia marina*, of seashores and saline or brackish soils, are there; *Sabatia amoena* (Raf.) G. Don (*S. stellaris* Pursh) of "salt marshes" was frequent; and the coastal *Lippia nodiflora*, the previous northern limit of which was on Knott's Island, abounded. Best of all, the *Pluchea* was a narrow-leaved and relatively small-headed plant, the tropical and sub-tropical *P. purpurascens* (Sw.) DC., heretofore unknown from north of southeastern Georgia and on the labels from there and from Florida frequently designated as growing on "salt marshes" or "brackish shores". In view of the assertion so definitely made to us by many who know Back Bay that it is "strictly fresh", it would be interesting to have analyses of the lowest films of water.

The material brought back to Petersburg from Back Bay was so extensive that we could get out on the 26th only for a short local trip. Having been told of a springy and mossy swale east of Burgess, where trumpets (*Sarracenia flava*) abound, we went to investigate. The swale, one of the best areas of the *Sarracenia* we know, was a gem, in spite of cattle and hogs. They had left the extensive colony of *Juncus caesariensis* Coville (*J. asper*), a species formerly supposed to be a New Jersey endemic, but subsequently found by Grimes near Williamsburg and by us in eastern Henrico County, in a spring-fed sphagnous bog greatly resembling this one, and recently discovered at an intermediate station (in Anne Arundel County, Maryland⁹). Now we had it in Dinwiddie County, and, just as in Henrico County it is associated with a group of singularly localized plants, so here its associates were among the rarities. For, at last, we were

⁹ A. V. Smith, RHODORA, xli. 111 (1939).

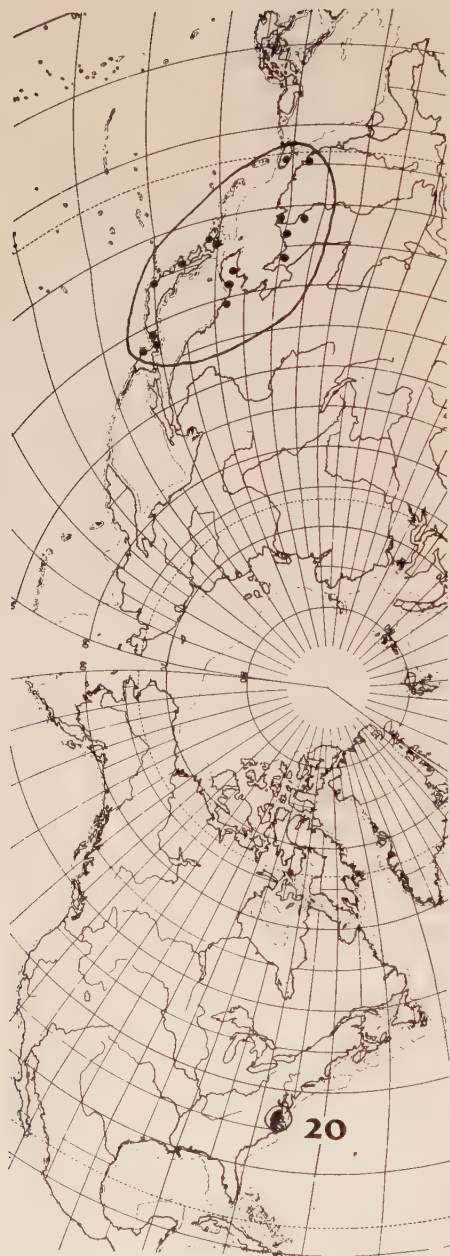
getting *Fuirena breviseta* Coville, which, known northward into North Carolina, we had vainly watched for in many Virginian swales. Here, too, was *Eriophorum virginicum*, a species very rare on the Coastal Plain of the state but frequent among the mountains; and mingled with them were tufts of *Scirpus debilis*, which we had never met in the state, though it is known in the Piedmont and upland area to the west. The *Pycnanthemum* of this bog puzzled us. Miss Elizabeth Boomhour of Duke University, who is closely studying the genus, tells me that it is *P. verticillatum*, heretofore known in the state only from the western counties. For a spot almost at our headquarters this one had too long been neglected. As we came up from the bog to the house of the owner, Mr. Blaha, a highly intelligent gentleman, we walked on rosettes of *Sanguisorba minor* which, we were told, colors areas of the farm when in flower. Young Mr. Blaha telling us of another swale which, however, had been plowed and, therefore, might not yield much, we went with him to look it over. But we were quickly diverted by the great abundance of dead-ripe and dropping fruit on *Vitis Labrusca*. Here in eastern Virginia it had been dropping for several days; in fact, on the 22nd of August we had found the fruit all on the ground in Charles City County. In New England we gather it a month later. In 1934 Long and I had first noted that the Fox Grape of the Coastal Plain of Virginia has less shouldered and smaller-toothed leaves than farther north and inland and that there is a somewhat evasive difference in the pubescence of the lower side of the blade, this frequently leaving a varnish-like print on the pressing-paper. Now, at last, we had good fruiting material. In Part II I shall illustrate true *V. Labrusca* (PLATE 636) and this Coastal Plain variety (PLATE 639) of it.

The brief half-day at the end of the August trip spent in weeding Petersburg, was, as usual, productive. *Humulus scandens* (Lour.) Merr. (*H. japonicus*) is there rapidly spreading, as it does farther north; *Leptochloa fascicularis* is coming in as a weed; and *Euphorbia heterophylla*, which we had never seen in Virginia, is appearing in waste spots. In the Norfolk and Western yard great clumps of true hirsute-sheathed *Eragrostis hirsuta* (Michx.) Nees have become established. In RHODORA, xli. 500 (1939), I pointed out that this typical extreme

of the species is essentially southern, the common var. *laevivaginata* Fernald of eastern Virginia having glabrous sheaths.

In September (14-24) we inevitably turned to the tidal marshes and tidal shores of the rivers. In view of the difference of 8 hours for low tide at the mouth of the James and at head of tide at Richmond and similar differences between Yorktown and head of tide on its two chief tributaries, the Pamunkey and the Mattaponi, I had asked my mathematically addicted son to prepare tables showing when we could expect low tide at different points, especially on the James and the Chickahominy. Armed with this invaluable document, Long and I were enabled to use our daylight to the best advantage for, if the tide was low at the mouth of the Pamunkey at 8:20 in the morning it would not be low at Windsor Shades, about 13 miles to the southwest, on the Chickahominy, until 12:40 noon. Thus, by careful planning we could collect at low-tide level on one river, then in a few minutes reach an adjacent river while the tide was just ebbing.

Our first adventure on tidal shores for the month was at the margin of the James at "Four Oaks", just below the ferry-landing near Harrison Point. Tide, as we expected, was going out, gradually exposing a broader and broader belt of estuarine plants. Here were the usual species of tidal shores, *Panicum agrostoides* var. *condensum* (Nash) Fernald, *Sagittaria falcata* Pursh, *Aeschynomene virginica*, *Lilaeopsis chinensis* (L.) Ktze., etc.; and, nestled among them, unmistakable *Eriocaulon Parkeri*, which we had found along Powhatan Creek, and *Isoetes saccharata*, which, when we got it on the lower Nottoway, was the first from south of the Potomac. *Commelina diffusa* was finely flowering and, since it is necessary to catch the expanding corollas early in the day if one wants good material, we proceeded to lay the sky-blue flowers between folds of waxed paper (to prevent adhesion to the pressing paper), when we suddenly espied its relative of Wilcox Wharf now in full bloom. We were greatly excited, for the plant, which we soon found to be a characteristic element in the fresh tidal marshes of the James, Chickahominy, Pamunkey and Mattaponi and their tributary creeks and for want of a name called "Pinky Posy," proves to be *Aneilema Keisak* Hassk. (MAP 20), an addition to the more



MAP 20, bicentric Range of ANEILEMA
KEISAK.

than 350 identical species sharing eastern Asia and eastern North America. In view of the recognition of this striking relationship for nearly a century and of our supposed familiarity with the flora of the Atlantic states, it was certainly very thrilling to be adding another to this ancient series of species, now with a strikingly bicentric range. While we were enthusiastically collecting *Aneilema* and laying its freshly expanded flowers between waxed papers, the owner of "Four Oaks", Mrs. Fox, came to the shore and, after learning the cause of our excitement, most hospitably invited us to her porch for refreshment and for shelter from the extreme heat. Mrs. Fox's hospitality is what we unfailingly meet from the owners of estates along the James, as soon as they learn what the pair of wet and muddy naturalists are really doing. But to return to the tidal

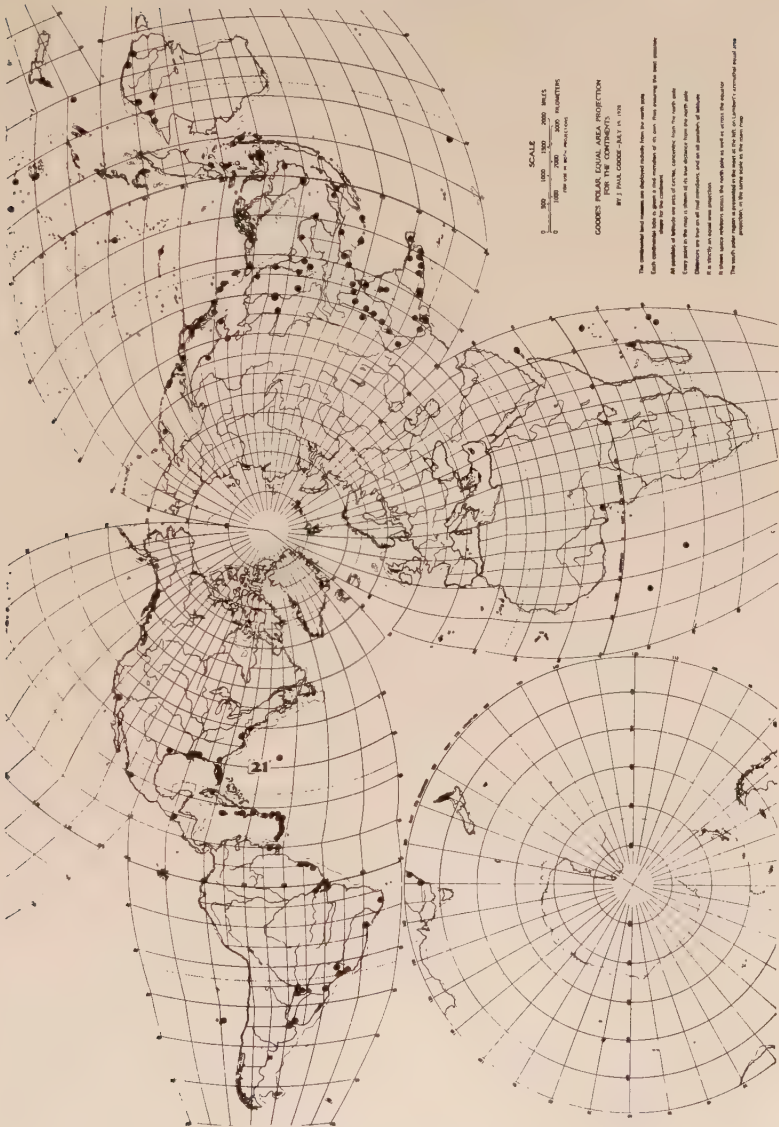
margin of the James. Seeing a gigantic *Cassia fasciculata* Michx. (*C. Chamaecrista* of our manuals not of L.), nearly 5 feet high, I pulled the plant because of its exceptional size, planning to trim it down and fold it back and forth in press, as a record specimen. But merely casual examination caused us to keep the segments, for the pubescence seemed to us unfamiliar and the legumes and seeds enormous—legumes up to 8.5 cm. long and 1 cm. broad, the immature seeds 7 mm. across. We were frankly puzzled by it, for its habitat (inundated tidal mud) was all wrong for *C. fasciculata* and its details were just as atypical. I had unwittingly pulled up the only individual and there were no ripe seeds to scatter!

We had spent several hours on the shore at "Four Oaks" and when we left the tide was turning. Incidentally, when we had left home in the morning we had started out to visit one of the marshes near the head of tide on the Chickahominy; and now it would soon be too late. Quite at random we drove down to "Shady Rest", the place of Mr. W. T. Walls at Windsor Shades. Mr. Walls, keenly interested in the flora of his marsh, told us that from April to October there is something bright flowering there. The season evidently starts with golden club (*Orontium*) and in September the inevitable *Aeschynomene virginica* with creamy-yellow and purplish papilionaceous flowers towered above golden masses of *Bidens laevis* and forms of *B. coronata*. *Aneilema Keisak* leaned on the other vegetation and ascended to a length of 6 feet, its roseate flowers borne in elongate but interrupted leafy racemes. *Eleocharis quadrangulata*, which in Virginia is usually, if not always, confined to tidal marshes and shores, abounded, along with unusually tall *Sacciolepis striata* (with panicles up to 3 dm. long), and towering high were the great inflorescences (up to 1 m. long) of the estuarine variety of *Rhynchospora macrostachya*. The tide was rapidly making but outside the dense swale we were able to get the inevitable *Isoëtes saccharata* and, best of all, a few quite characteristic fragments of *Potamogeton Spirillus* Tuckerm. In the northern part of its range ubiquitous in fresh ponds and streams, it there shows no aversion to tidal waters. Southward, however, its southeastern known extension has been in tidal waters of the

Delaware system. New to Virginia, still farther south, it is here in the tidal margin of the Chickahominy.

Aiming another day for the great tidal marshes of the Chickahominy, we crossed the James from Jordan Point to Harrison Point and were starting down-stream when, crossing the somewhat uninspiring Kimmages Creek, we saw that it too was tidal. *Aneilema* and its regular companions were here, but nothing novel. Then, driving out toward Weyanoke, we came to the upper stretch of marsh along Kittewan Creek. The brilliant display of *Bidens* with high-towering *Aeschynomene* lured us in. Here was the big *Cassia*, nearly 6 feet high, in greatest profusion, holding its characters and obviously completely drowned at high tide—a most unusual habitat for any *Cassia*, but on the fresh tidal reaches of at least the James and the York and their many tributaries the conventional one for this conspicuous plant. In Part II I shall describe and illustrate it (PLATE 635). *Aneilema Keisak*, of course, was here, the creeping, leaning or ascending stems freely forking, and in marginal thickets beginning to mature the seeds which have enabled Dr. Hiroshi Hara and me to conclude that it is inseparable from the Japanese plant, except that in eastern Asia the petals may often have a more violet or bluish coloring. Emulating in stature its still thrilling associates, *Spiranthes cernua* var. *odorata*, which we had earlier found on the inundated bottomland of Fontaine Creek, was here abundant and in full bloom, the splendid racemes less fragrant than in the relatively small typical *S. cernua*.

Crossing the mouth of the Chickahominy, we went to its tributary, Gordon Creek. The broad tidal marshes there were splendid but the deep submerged paste-like clay was so vigorous in its suction that we soon quit. All the specialties of the fresh marshes were there and we also got the pale-scaled estuarine form of *Cyperus rivularis*: forma *elutus* (C. B. Clarke) Küken-thal, a pale form characteristic of such shores northward to southern Maine and strikingly unlike typical dark-scaled and relatively low *C. rivularis*. Along Gordon Creek the pale form was 6 dm. high and with an inclination to thickened bases. Quitting Gordon Creek, which would yield good returns if one could explore it by boat, we stopped just above the entrance of

MAP 21, Range of *CYPERUS BREVIFOLIUS*.

the Chickahominy into the James, below Barrat's Bridge (formerly Barrat's Ferry, the bridge opened during the summer of

1939). The still pretty nice series of species abounds there; but under water, completely submersed when we found it, was the tidal-shore form of *Xyris caroliniana* with floating ribbon-like leaves, which Long had been sending me from the lower Delaware. Here, again, was another identity, though this only of minor taxonomic importance, between the flora of the lower Delaware and of these southeastern Virginian tidal shores. The great prize of these marshes, however, was the stoloniferous and extensively creeping pantropical *Cyperus brevifolius* (Rottb.) Haussk. (*Kyllinga brevifolia* Rottb.), widely dispersed in tropical and subtropical regions (MAP 21) but heretofore unknown in eastern North America between its stations in Florida and adjacent Georgia and the isolated colony on the lower Delaware. This was pretty fine but, after helping dig a good series of plants and leaving Long on dry land to lay them into paper, I pushed farther out into deep water and found myself in a colony of a purple-rayed *Boltonia*. This was the third species of the genus we had found in eastern Virginia and quite like one which Griscom and I had collected on our late-September trip in 1933 on the tidal marshes of North Landing River. By current treatments all three go into the too inclusive *B. asteroides*, but the plant of tidal marshes is freely stoloniferous, the other two species of southeastern Virginia not at all or but slightly so, and one of them has tiny white heads. The discovery of the plant of North Landing River had led Griscom and me to attempt a revision of the group. Our tentative results were held back pending receipt of photographs of types from abroad; but this discovery of a new colony was the signal to revamp and strengthen the unpublished treatment of seven years ago. This, with illustrations, will be found in Part II.

Forced out by high tide, we drove west, hoping to beat the incoming tide up-river. We took a chance on the shore near Tettington, but there we found sand-beach, with vigorous weedy colonies of soy bean and peanuts and other signs of man's invasion. The native flora, however, was interesting, for here, far up the James and mingled with typical plants of fresh sands, there were colonies of *Spartina patens* var. *junceae*, *Panicum amarum* and other maritime species. Best of all, the upper border of the beach was covered with characteristic *Apocynum*

sibiricum Jacq., the northern white-flowered species which Woodson, in monographing the genus, recorded southward in the Atlantic coastal region only to Delaware and the District of Columbia.

Still having a remnant of daylight when we reached Charles City Courthouse, we drove northward for a ten-minute glimpse of the Chickahominy at Long Bridge. The ten minutes were well rewarded. On the wooded bottomland in New Kent County we might have been in Southampton County, 50 miles to the south. Here were *Leersia lenticularis*, which we had never seen north of Sussex County, *Hypoxis leptocarpa* Engelm. & Gray, a southern species which was new to Virginia when we found it in Southampton, and *Lysimachia radicans*, with which we had been keeping regular appointments at Cypress Bridge in southern Southampton. The bottomlands of the Chickahominy evidently need close study; but we had been out since an early breakfast, had explored six remote localities and, with darkness coming on, were willing to leave the Chickahominy bottoms and "call it a day".

Our September work had led us to the region north of the James, but we had not wholly forgotten the allurements of the pine-barren regions of western Nansemond and southeastern Southampton. The sandy pine barrens and pinelands several miles south of Franklin, where "Long's Flannel-weed", *Chrysopsis Longii* Fernald in RHODORA, xl. 467, pl. 531 (1938) and *Tradescantia rosea* Vent. var. *graminea* (Small) Anders. & Woodson abound, are always fascinating. On most of our visits heavy rains had made the wood-roads too full of water-holes for comfortable driving. On September 20th, however, the roads being well dried out, we made a circuit out to Point Beach on the Nottoway (where *Styrax americana* is very fine), thence northwestward to Round Gut on the same river and eastward via Wiggins School to the automobile road. Fine material of many rare species was collected and we were delighted to find *Zenobia pulverulenta* in Southampton County, much taller than in Nansemond (even if Pursh, nearly 140 years ago, "beat us to it" by collecting in Southampton the very rare *Litsea geniculata*, which has not subsequently been found, he did not discover *Zenobia*!). The local *Trichostema setaceum* Houtt. (*T. lineare*)

abounded and was very large, and in a patch of hickory and oak woods (usually relatively rich) *Kuhnia eupatorioides* was at its easternmost station. In the sandy woods at Round Gut the *Tephrosia spicata* looked unusual. This was because the plants are nearly glabrous, instead of densely pilose-villous. I have been tempted to glorify the type-locality of this plant by applying to the latter the name *splanchnodita*, but the glabrous or glabrescent plant occurs at other stations; I am, consequently, giving it a less suggestive name in Part II.

Chinquapin, *Castanea pumila*, was heavily fruiting in the barrens and very puzzling. Some shrubs had the burs densely covered with erect long-rayed scales, others had the rays or bristles short and erect, while in others the remote scales had depressed and horizontally divergent rays, their tips often not touching and thus leaving broad naked areas. Such differences in the cups of acorns would be strongly specific, but in *Castanea pumila* the different variations all have essentially uniform foliage and nuts. We ate the nuts inordinately and filled all receptacles we could find with more nuts to take home. Tragically, however, when we opened the containers at home, we found them squirming with the fattest of grubs. We could merely take comfort by remembering the ancient conundrum about the half-worm in the partly eaten apple! I have carefully compared our material with the extensive series at the Arnold Arboretum. The shrub or small tree with broad naked spaces on the involucre is *C. pumila*, var. *Ashei* Sudworth, heretofore known from southeastern Texas, Arkansas, and Louisiana to Georgia and northeastern North Carolina. The one with very long erect bristles is a close match for *C. pumila*, var. *Margaretta* Ashe, which Ashe (for years familiar with the Carolinas) knew chiefly from "the upper edge of the longleaf pine lands of Texas and Louisiana". Ashe did not know it from the Atlantic States (only from western Alabama, Mississippi, Louisiana, Arkansas, Oklahoma and Texas). This isolation in southeastern Virginia is like that of scores of other plants; the next step is to find var. *Margaretta* and the other plants in the Carolinas and Georgia.

Returning on the 22nd to the pine barrens of western Nansemond County, I asked Leonard to stop the car at the wood-road leading to Milk Landing, where in July he and Long had

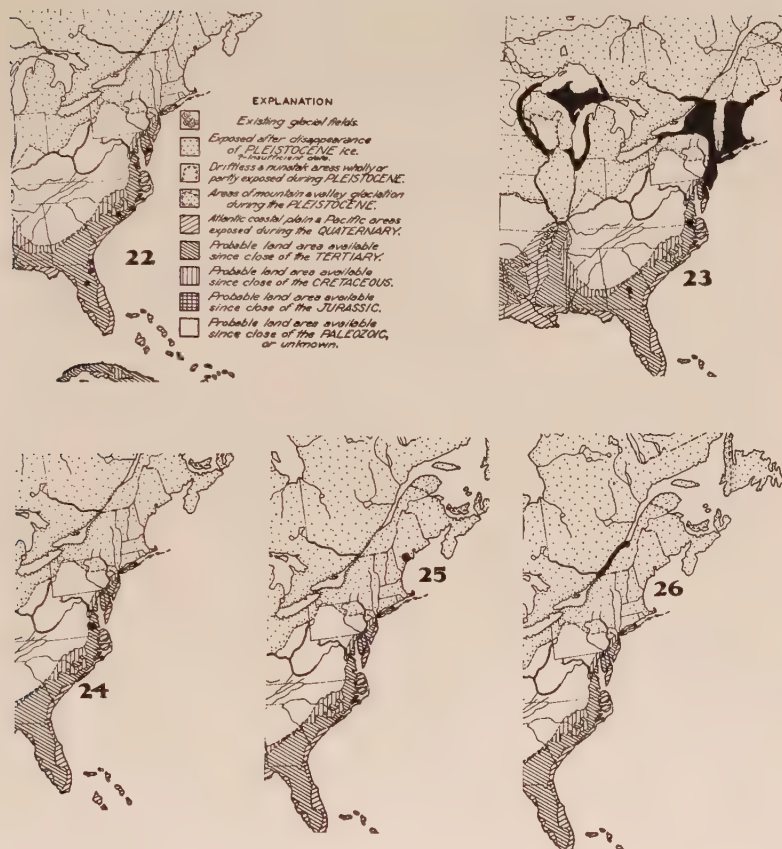
been unmercifully peppered with seed ticks. I knew that I must start alone, for the memories of the place were still too sad for me to hope for Long's company. But he soon caught up with me, fearing that I might discover something interesting and correctly reasoning that the seed ticks of two months before were no longer waiting for him. And when we got to Milk Landing the Blackwater was at low tide. The little ribbon of tidal vegetation under the overhanging shrubs was tiny and interrupted but in five minutes we had *Sagittaria subulata*, the submersed form of *Xyris caroliniana* and, near the head of tide which runs up from Albemarle Sound in North Carolina, *Aneilema Keisak*. It surely must grow in North Carolina as well as in Virginia! Slightly farther down-river, at Cox Landing, we got *Eriocaulon Parkeri* only 3½ miles north of North Carolina.

The sphagnous savannah-like bog at Tom Hunter's was gorgeous with the orange and brown heads of *Coreopsis oniscicarpa* Fernald in RHODORA, xl. 472, pl. 533 and 534 (1938). The plants were up to 9 dm. high, often with 30 to 60 heads. This is the greatest station we know, but the species continues abundant eastward to the region of Cleopus. South of this area, not far from Cathole Landing, the white sands support, among superabundant *Carphephorus bellidifolius*, fine colonies of *Phlox Hentzii* Nutt. (discussed in Part II) at its easternmost known station, *Eupatorium tortifolium* Chapm., which we had already got near Sandy Landing, a northern extension; and, the great prize of the day, extensive carpets of a prostrate *Desmodium*, now over-ripe but quite strange to us. It proves to be true *D. glabellum* (Michx.) DC., quite unlike the rare plant which passes in our manuals under that name, the latter being *D. humifusum* Beck. Michaux's South Carolina type is represented in the Gray Herbarium by a fragment (leaf) and by a very clear photograph. Otherwise, so far as I can find, the species is unknown. In late August, 1940, we secured a representative series of specimens. These will be discussed in a later report. The discovery of *Desmodium glabellum* at dusk closed our exploration of the native flora for the month, except that on the 23d we went to Carey Bridge to get flowering material of *Chelone obliqua* (found too young earlier in the season).

The regular 2-hour weeding of Petersburg, after the presses were finally emptied and we awaited the afternoon train, brought us, among other unusual adventives, a labiate which greatly puzzled us. It proves to be *Hyptis mutabilis* (A. Richard) Briq. var. *spicata* (Poir.) Briq., the West Indian and Floridan representative of a tropical American species. At Petersburg, growing on a weedy bank, it is far from home. The weed which makes the fortunes of many residents of Petersburg and of Richmond is *Nicotiana Tabacum*. We were more interested in *Hyptis mutabilis*!

In October (12-17) our limited time was mostly devoted to the fresh tidal shores, although we started off by returning to the Great Dismal Swamp, near the Camp Lumber Company's plant southeast of Whitemarsh School. We were primarily after mature fruit of *Ilex coriacea*, already noted; but we found the wonderfully developed phyllodia of *Sagittaria Weatherbiana* Fernald which will be specially noted in Part II, extended eastward the ranges of *Leersia lenticularis* and *Scirpus divaricatus*, and, in the clearings, found unusually strong and heavily fruiting plants of *Viola esculenta* Ell.

On the 13th we returned to "Shady Rest" for mature fruit of *Aneilema Keisak*. On this trip we noticed that the deep channel which runs through the marsh was full of *Potamogeton epihydrus*, var. *Nuttallii* (C. & S.) Fern., here found for the first time south of the Potomac, a fitting companion for the northern *P. Spirillus* which we got here in September. High tide forcing us from the Chickahominy, we then went north to the York, where we could still have four hours of low water. We spent some time on the sandy beach north of Holly Forks, this region of the upper York being essentially sea-shore, with carpets of *Euphorbia polygonifolia* and other maritime plants. On a steep sandy slope there was an abundance of *Sporobolus asper*, which we had never met in Virginia. Upon referring to Hitchcock's Manual it becomes evident that the species is new to the state. It was obvious that for fresh tidal marshes we must go up the Pamunkey and the Mattaponi which unite to form the broad salty York. So we drove up the former river and tried the marshes east of White House. *Aneilema*, the new *Cassia* and *Aeschynomene* were there and we at once set ourselves the task



MAP 22, Range of *BACOPA CYCLOPHYLLA* (derived largely from *Pennell*); 23, of *POLYGONELLA ARTICULATA*; 24, of *BACOPA OBOVATA*; 25, of *CARDAMINE LONGII*; 26, of *GENTIANA VICTORINII*.

of following these three index-species to the northern limits of their range (a task not yet finished).

Next day, after some exploration in other areas, we reached the Mattaponi at Horse Landing, near King William Courthouse. The shores were so fine and the tide so unaccommodating that we returned for a second day, at low tide. All the standard species, including the variety of *Rhynchospora macrostachya*, were there, as were the less common *Eriocaulon Parkeri* and *Elatine americana*. *Spiranthes cernua* var. *odorata* was there producing young

plants (rosettes) at the tips of the prolonged roots;¹⁰ and in the outer mud, exposed at extreme low tide, *Hypericum mutilum* var. *latisepalum* Fernald, heretofore known only from Florida to Texas, was mixed with scattered individuals of the excessively rare and little collected *Bacopa cyclophylla* Fernald (*Herpestis rotundifolia* Gaertn. f., not *B. rotundifolia* (Michx.) Wettst.), this being the eighth known station and the first between Wilmington, North Carolina and the two colonies on the Eastern Shore of Maryland (MAP 22). In southeastern Virginia *Bidens coronata* (L.) Britton is chiefly represented by var. *trichosperma* (Michx.) Fernald in RHODORA, xl. 350, t. 506, figs. 8 and 9 (1938); but along the Mattaponi some plants had coarse and often simple leaves and very large broad-based awns. They can be referred only to typical *B. coronata*, which in the Atlantic States had been unknown south of the lower Delaware.

Farther up river, opposite Walkerton, the marsh was bordered by a towering thicket of *Aeschynomene*, so dense and so high above our heads that we finally abandoned the last lingering pretense that it is rare! And slightly below Walkerton, on the King and Queen side of the river, the index-plants were all seen, and with them *Bidens coronata*. Having trailed the quarry to King and Queen, the obvious step was to hunt for the group on the next river to the north, the Rappahannock. We made a tactical error, however, in going toward Tappahannock, for there the marshes are salt and it was obvious that we must go much farther up river for fresh tidal shores. Consequently, the hour being late, we went to the nearest open shore, at Richmond Beach, on the Rappahannock in Essex County. The maritime character of the area was evident from the abundance on the sands of *Diodia teres* var. *hystricina* Fern. & Griscom of the sands of Cape Henry and of Yorktown. In the thicket back of the beach the giant *Arundo Donax*, up to 15 feet high, was thoroughly naturalized. We selected small panicles and by folding them back and forth and tying their tips to the bases of the inflorescences secured specimens which can be kept within the limits of the herbarium-sheet.

One trip was made to the pine barrens south of South Quay.

¹⁰ Correll says: "often in dense clumps because of its stoloniferous habit"—D. S. Correll, Bot. Mus. Lfts. Harvard Univ. viii. 81 (1940).

At Tom Hunter's we were happy to find the new *Lilium* with mature fruit and abundant seeds; and in one seeping or springy spot *Utricularia fibrosa*, rare in Virginia, was flowering. *Quercus cinerea* Michx., abundant in all the pine barrens of southeastern Virginia, is sometimes well-behaved, but it often mixes with the other oaks. One of the most striking hybrids, of which we found a characteristic tree, is $\times Q. subintegra$ Trelease (*Q. cinerea* \times *falcata*). In 1940, at the northern limit of *Q. cinerea*, in Sussex County, we felt that its hybrids with various species were almost as abundant as typical *Q. cinerea*. One of our chief errands at this time was to collect, at last, flowering material of the *Polygonella*, of which we had found seedlings in July. The plant was very abundant, and we traced it across the state-line, nearly to Wyanoke in Gates County, North Carolina. The larger plants, heavily loaded with flowers and fruit, were 8 dm. high, but, alas, they are only the northern *P. articulata* (MAP 23). Alas!—nevertheless the species is really a most interesting one to find in southeastern Virginia and northeastern North Carolina. There is an old specimen of Thomas Nuttall's at the Philadelphia Academy, marked simply as from "Georgia". Otherwise, there are no specimens of this essentially northern species in the herbaria of the Philadelphia Academy and the New York Botanical Garden nor in the Gray Herbarium from south of the Eastern Shore of Maryland. Our disappointment in not having a typically more southern species was, consequently, tempered.

Thus our season of botanical exploration came to a close. It had been one of unusual discoveries in view of all the previous work in the same area and, even if the record shows less than one hundred maintained species and geographic varieties, which by some would be treated as species (for instance *Andropogon virginicus*, var. *glaucus*, maintained by Nash, Small and Hitchcock as a species, *A. capillipes* Nash), the inclusion of several well marked forms which deserve designation (some of them usually called species, as in case of *Commelina crispa* Wooton or the green-leaved form of *Zenobia*, maintained by Small as a species, *Z. cassinefolia*) fully justifies the title I have given to this report of progress. The records in abbreviated form constitute Part II; for the convenience of users some of the data

diffusely stated in the Narrative is repeated. In Part III brief consideration will be given the phytogeographic problems raised by some of the discoveries, especially those of the fresh tidal shores.

PART II. ENUMERATION AND CONSIDERATION OF THE MORE NOTEWORTHY PLANTS

As in previous reports species, varieties and forms of significance in reaching an understanding of the flora of the Coastal Plain of southeastern Virginia are enumerated. Some records are from collections of earlier years; a few are of plants in the Gray Herbarium, collected by others; and in a few cases specimens collected in 1940 are included in order to complete the record to the date of going to print. In most cases, where the plants were collected by Long and me, it has seemed unnecessary to repeat the names of the collectors. In course of identifying the material many genera or groups of species have been critically studied. In so far as these revisional studies have grown out of the Virginia work they are here included. The photographs and material for the plates have been prepared by my assistant, WALTER H. HODGE, or by my son, HENRY G. FERNALD. The maps showing world-ranges are on base-maps of the Goode series, copyrighted by the University of Chicago. The initial cost of photography and preparation of blocks has been partly met through appropriations for personal research from the Department of Biology of Harvard University; the cost of their reproduction through the generous support of Mr. Long. The names of plants thought to be reported for the first time from Virginia are preceded by an asterisk (*).

CHEILANTHES LANOSA (Michx.) Watt. SUSSEX COUNTY: ledges in rich woods at the "fall-line" along Nottoway River, above Double Bridge, about 6 miles northwest of Jarratt, no. 10,862.

Close to the inner border of the Coastal Plain. See p. 383.

EQUISETUM ARVENSE L. SOUTHAMPTON COUNTY: in lime-marl, wooded bottomland of Three Creek, northwest of Carey Bridge, no. 10,071.

Equisetum arvense, so common in all damp habitats in the North, is rare in southeastern Virginia, and always, so far as we have observed, in calcareous pockets. See p. 363.

LYCOPodium INUNDATUM L., var. **ADPRESSUM** Chapm., forma **polyclavatum** (McDonald), comb. nov. *L. adpressum*, f. *polyclavatum* McDonald in Fern Bull. ix. 9 (1901). *L. alopecuroides*, var. *adpressum*, f. *polyclavatum* (McDonald) Clute in Fern Bull. xvii. 45 (1909). SUSSEX COUNTY: argillaceous swale southwest of Grizzard, no. 10,866.

In originally describing the variety, Chapman used the spelling *Lycopodium inundatum*, var. *adpressum* Chapm. in Bot. Gaz. iii. 20 (1878). Subsequently, however, he took up the alternative spelling, var. *adpressum* Chapman, Fl. So. U. S. ed. 2: 671 (1883), holding to this altered spelling in the 3rd edition (1897). Most authors have used the second (and by Chapman obviously preferred) spelling. If it be maintained by some that an author has a right to correct his own error (assuming that Chapman so considered his first spelling), then, immediately, an equally strong group will argue that the original spelling must stand. As one who has been forced through typographic, orthographic or stenographic errors into misspellings, I have claimed the right to correct them. This is quite different from alterations made by others. In the latter cases, unless an evident error is corrected they are not justified. In the case of Chapman's name, of course, the original spelling was etymologically as correct as the substitute.

***L. CAROLINIANUM** L. GREENSVILLE COUNTY: argillaceous and sphagnous meadow northwest of Taylor's Millpond, nos. 10,075, 10,867.

Certainly a very rare plant in Virginia. We have met it only at this station, a much burned peaty meadow or swale, where the *Lycopodia* of bogs have a remarkable and perplexing development. I have been unable to trace the source of the record for Virginia, sometimes given. Lloyd & Underwood in Bull. Torr. Bot. Cl. xxvii. 158, 159 (1900), cited no material from between southeastern North Carolina and southern New Jersey, although there is a single station in Maryland. In August, 1934 (Claytonia, i. 3) Massey, in his account of the genus in the state, said: "No reports of its having been collected in Virginia are at hand." See p. 358.

ISOËTES SACCHARATA Engelm. Fresh tidal shores. KING WILLIAM COUNTY: Mattaponi River, at Horse Landing, near King William Courthouse, no. 11,508. NEW KENT COUNTY:

Chickahominy River at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice), no. 11,507. CHARLES CITY COUNTY: James River at "Four Oaks", below Harrison Point, no. 11,216. NANSEMOND COUNTY: Blackwater River, Milk Landing, south of South Quay, no. 11,217. SOUTHAMPTON COUNTY: Nottoway River, Knight's Seine Beach (Battle Beach), no. 10,082.

Pfeiffer, in her *Monograph*, cites no material from south of tributaries of the Potomac near Alexandria. Knight's Seine Beach is barely *not* in North Carolina; *I. saccharata* will doubtless be found in that state farther down the Nottoway or on the Chowan. See pp. 364, 391 and 393.

*I. ENGELMANNI A. Br., var. CAROLINIANA A. A. Eaton. GREENSVILLE, SOUTHAMPTON, NANSEMOND, SUSSEX and DINWIDIE COUNTIES, frequent and often abundant on the wooded bottomlands of the larger rivers and creeks (Meherrin and Nottoway Rivers, Fontaine Creek, Three Creek, Somerton Creek, Rowanta Creek) and even along small runs in the woods, fruiting from mid-May to August, usually in June, most colonies being over-ripe and nearly unrecognizable by mid-summer (many nos.).

Extension north from Georgia and mountains of North Carolina. See pp. 358, 367 and 375 and MAP 2.

TAXODIUM DISTICHUM (L.) L. C. Richard, var. IMBRICARIUM (Nutt.) Sudw. (*T. ascendens* Brogn.). Common on wooded bottomlands and even on tidal shores of rivers, many collections from James City, Sussex, Southampton and Greenville Counties.

Influenced by the persuasions of those who see two species of *Taxodium* in the South, we called our collections made in June *T. ascendens*. Finally, however, noting that the characters separating the two were very fickle, we reached the conclusion of Sudworth and of the late Carl Mohr. The latter's statement is one with which we have full sympathy:

Of smaller size than the species, with the leaves reduced in size and closely appressed to the deciduous branchlets, thus imparting to the tree a strikingly peculiar aspect. This character, however, is not constant, and the variety can scarcely be maintained, the same individual producing during the earliest stages of growth and on vigorous adventitious shoots leaves of the ordinary form.

This form passes freely into the species where the soil conditions are more favorable.—Mohr, Pl. Life of Alab., Contrib. U. S. Nat. Herb. vi. 325 (1901).

After a strong wind in early summer, many of the deciduous

branchlets bearing only the small leaves of the variety will be found on the floors of bottomlands. In Virginia, at least, this form is not confined to pond-margins, as it is sometimes said to be farther south. Probably var. *imbricarium* is not a true variety, but merely a state of development or a seasonal stage.

TYPHA TRUXILLENSIS HBK. PRINCESS ANNE COUNTY: brackish to fresh marsh along Back Bay, at eastern margin of Long Island, no. 10,476. SUSSEX COUNTY: argillaceous ditch by Norfolk and Western Railroad, about 2 miles west of Waverly, no. 10,477. See pp. 374, 376 and MAP 8.

Recorded in 1935 (RHODORA, xxxvii. 385) from shores of Back Bay, the first area known north of Florida. The station in Sussex County is 65 miles inland and extends the range northward to lat. $37^{\circ} 2'$, from the former northern limit at $36^{\circ} 40'$.

**POTAMOGETON SPIRILLUS* Tuckerm. NEW KENT COUNTY: Floating at outer border of fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice), no. 11,219.

Extension south from the lower Delaware River and adjacent waters of southwestern New Jersey and of Delaware. See p. 374.

P. EPIHYDRUS Raf., var. *NUTTALLII* (C. & S.) Fernald. NEW KENT COUNTY: in open water, fresh tidal marsh by Chickahominy River, at "Shady Rest", southeast of Windsor Shades (Boulevard Postoffice), no. 11,541.

Extension south from the Potomac. See p. 400.

TRIGLOCHIN STRIATA R. & P. To the station on North Landing River, recorded in 1936, add the following, also in PRINCESS ANNE COUNTY: inner border of brackish to fresh marsh along Back Bay, at eastern margin of Long Island, no. 10,479; turfy knolls in shallow pools in brackish to fresh marsh along Back Bay, east of Creeds, no. 10,876, very fine development, plants nearly 3 dm. high, with spikes more than 1 dm. long. See pp. 387, 388 and MAP 19.

SAGITTARIA SUBULATA (L.) Buchenau. To the few recorded stations add one in JAMES CITY COUNTY: tidal mud along Powhatan Creek, north of Jamestown Island, no. 10,877. KING WILLIAM COUNTY: fresh tidal shore of Mattaponi River at Horse Landing, near King William Courthouse, no. 11,512. NANSEMOND COUNTY: muddy tidal margin of Blackwater River, Milk Landing, south of South Quay, no. 11,220. See pp. 386 and 399.

**S. SUBULATA*, var. *NATANS* (Michx.) J. G. Sm. PRINCESS ANNE COUNTY: shallow pools in fresh to brackish marshes along Back Bay, east of Munden, no. 10,878; east of Creeds, no. 10,879;

along Nowney Creek, southeast of Back Bay Postoffice, no. 10,880. See p. 387.

I am keeping as var. *natans* the narrower-leaved plant which was included by Chapman, along with the coarser Florida plant, under his *Sagittaria natans*, var. *lorata*. As I interpret *S. subulata* it consists of four fairly marked varieties as follows.

S. SUBULATA (L.) Buchenau, var. **typica**. *Alisma subulatum* L. Sp. Pl. 343 (1753). *S. pusilla* Nutt. Gen. ii. 213 (1818). *Echinodorus subulatus* (L.) Engelm. in Gray, Man. 460 (1848). *S. subulata* (L.) Buchenau in Abh. Nat. Ver. Bremen, ii. 490 (1871).—Dwarf; leaves linear, strap-shaped, obtuse to acutish, 2–12 cm. long, 1–3 mm. broad, exceeding to shorter than scape, rarely with a narrow blade up to 2 cm. long and 4 mm. broad; inflorescence 1–4 cm. long; pedicels in 1–3 whorls, the 1 or 2 fruiting ones stouter and shorter than the others, recurved, 0.5–2 cm. long; bracts scarious, connate or spathe-like and oblique, obtuse or with prolonged tips, 3–5 mm. long; filaments 6–8, glabrous; fruiting heads nodding, 4–6 mm. in diameter; achenes obovate, 1.6–2.3 mm. long, 0.7–1.4 mm. broad, wing-margined, with slenderly keeled faces, the lateral to subterminal subulate beak 0.3–0.4 mm. long.—Fresh to brackish tidal mud, Florida and Alabama, north to Massachusetts.

Var. *NATANS* (Michx.) J. G. Smith, N. Am. Sp. *Sagittaria* and *Lophotocarpus*, 18 (1894), at least as to type. *S. NATANS* Michx. Fl. Bor.-Am. ii. 190 (1803)—photograph of type in Gray Herb. *S. natans*, var. *lorata* Chapm. Fl. So. U. S. 449 (1860), in part only.—Leaves ribbon-like or with dilated lanceolate to ovate blades up to 4 cm. long and 2 cm. broad, the obtuse phyllodia 1–3 dm. long and 3–6 mm. broad, often overtopped by the scape (1–4 dm. long); inflorescence 3–10 cm. long, the 1–3 recurving pistillate pedicels 0.5–3.5 cm. long.—Shallow pools along the coast, Florida to southeastern Virginia.

Var. *GRACILLIMA* (Wats.) J. G. Smith in Mem. Torr. Bot. Cl. v. 26 (1894) and N. Am. Sp. *Sagittaria* and *Lophotocarpus*, 19, pl. 14 (1894). *S. natans* Michx., var. (?) *gracillima* Wats. in Gray, Man. ed. 6: 556 (1890).—Very elongate, up to 1 m. or more long, and submerged; leaves (phyllodia) prolonged, 1–3 mm. wide; scape prolonged; inflorescence 1–3 dm. long, with 2–4 very remote whorls; bracts (at least of the upper whorl) subherbaceous, elongate, mostly caudate-tipped, nearly distinct, 6–10 mm. long; pedicels all elongate, the lower with pistillate flowers, arched or spreading, 0.3–2 dm. long, not much thickened; fruit unknown.—Deep water of streams, eastern Massachusetts to southeastern Pennsylvania.

Var. **lorata** (Chapm.), comb. nov. *S. natans* Michx., var. *lorata* Chapman, Fl. So. U. S. 499 (1860) in great part. *S. lorata* (Chapm.) Small in No. Am. Fl. xvii¹. 52 (1909), as to type.—The coarsest extreme; phyllodia 0.8–1.5 cm. broad, 2–9 dm. long; inflorescence with 3–6 whorls; sepals relatively large; fruiting head up to 1 cm. in diameter; achenes 2–2.5 mm. long, with 5–7 crests.—Brackish waters, Florida.

The somewhat mystifying bibliography in the treatment in the North American Flora gives the type locality of *Sagittaria lorata* (Chapm.) Small as "Carolina". Chapman, in originally publishing *S. natans*, var. *lorata*, upon which *S. lorata* rests, said "Brackish water, along the west coast of Florida". On the same page in the North American Flora, in the synonymy of typical *S. subulata*, we get the following entry: "*Sagittaria natans lorata* A. Gray, Man. ed. 5. 494. 1867". Search for the latter combination fails to reveal it; but the combination, *S. subulata natans* (Michx.) J. G. Smith, properly published by Smith in his monograph of the genus (1894) failed to win citation in the North American Flora.

S. WEATHERBIANA Fernald in RHODORA, xxxvii. 387, pl. 385 and 386, fig. 1 (1935).

In summer the broad phyllodia are mostly shriveled, though conspicuous in early spring. On October 12, we found the plants of pools in the Great Dismal Swamp with completely shriveled mature foliage but with newly developing phyllodia of extraordinary beauty, with the whole breadth or a wide central band filled by large lacunae, in this suggesting the foliage of *Potamogeton epihydrus*. It is evident that *S. Weatherbiana* makes its principal growth from autumn to spring, as do *Hottonia inflata* and some other aquatics. See pp. 359 and 400.

VALLISNERIA AMERICANA Michx. To the station recorded in 1936 add another, also in PRINCESS ANNE COUNTY: abundant on sandy bottom of Back Bay (depth slightly more than 1 m.), Long Island, no. 10,881. See p. 387.

ANACHARIS Densa (Planch.) Victorin. To the station in Dinwiddie County reported in 1938 add one in JAMES CITY COUNTY: pool in cypress swamp back of Chickahominy River, below Barret's Bridge (or Ferry), no. 11,221.

DIPLACHNE MARITIMA Bicknell. PRINCESS ANNE COUNTY: inner border of brackish to fresh marsh along Back Bay, at eastern margin of Long Island, no. 10,522; shallow pools in

brackish to fresh marsh along Back Bay, east of Munden, no. 10,833; similar habitat east of Creeds, no. 10,884. See pp. 370 and 387.

GLYCERIA ARKANSANA Fern. To the stations in Greenville and Surry Counties recorded in 1938 add the following. SUSSEX COUNTY: wooded bottomland, Three Creek, southwest of Grizard, no. 10,128; bottomland swamp, Nottoway River, southwest of Homeville, no. 10,129. GREENSVILLE COUNTY: wooded bottomland of Fontaine Creek, southeast of Taylor's Millpond, no. 10,127. See p. 360.

ERAGROSTIS HYPNOIDES (Lam.) BSP. Local range extended eastward to the Blackwater valley. NANSEMOND COUNTY: sandy border of rill in swampy woods east of Milk Landing, south of South Quay, no. 11,223.

E. PEREGRINA Wiegand. Range extended southward to PRINCESS ANNE COUNTY: roadside, open muddy and sandy shore of Back Bay, east of Creeds, no. 10,891. SOUTHAMPTON COUNTY: railroad yards and waste places, Franklin, no. 10,886.

E. HIRSUTA (Michx.) Nees. To the station in Arlington County (see RHODORA, xli. 500) add one in DINWIDDIE COUNTY: large clumps in cinders of freight-yard of Norfolk and Western Railroad, Petersburg, no. 10,892.

The typical southern plant with strongly hirsute sheaths. See p. 390.

ARUNDO DONAX L. To the station in Sussex County reported in 1938 add one in ESSEX COUNTY: woods bordering sandy beach of Rappahannock River at Richmond Beach, southeast of Tappahannock, no. 11,527, plants 10-15 feet high. See p. 402.

TRIODIA CHAPMANI (Small) Bush. SOUTHAMPTON COUNTY: dry white sand of clearings in oak and pine woods bordering Assamoosick Swamp, south of Sebrell, no. 10,894; border of sandy woods near Three Creek, northwest of Carey Bridge, no. 11,222. See pp. 378, 383 and MAP 15.

Extension inland from Nansemond County. Experience in the field, now extending over several years, indicates that *T. Chapmani* is abundantly distinct from *T. flava*. Hitchcock treated it as inseparable, but in 1934, Griscom and I, finding it in the sandy woods back of Cape Henry, recognized it as at least varietally separable, *T. flava*, var. *Chapmani* (Small) Fernald & Griscom, in RHODORA, xxxvii. 133 (1935). Subsequent observations show that, whereas the wide-ranging *T. flava* (L.) Hitchc. prefers relatively good soil and is inclined to follow roadsides, *T. Chapmani* is restricted to sandy pinelands and oak-scrub. It not only has the spikelets long-stalked; its very

narrow leaves are bluish-green, 5–7 mm. broad, and strongly inclined to become inrolled. Its open and skeleton-like panicle has the bases of the principal branches surrounded by ring-like pulvini with very long hairs, whereas the denser panicle of *T. flava* has the shorter hairs confined to the upper sides of the axils of the branches. *T. Chapmani* reaches its northernmost limit, apparently, in the sands of southeastern Virginia.

**SPOROBOLUS ASPER* (Michx.) Kunth. NEW KENT COUNTY: steep sandy bank of York River, near mouth of Fillbate's Creek, north of Holly Forks, no. 11,525. See p. 400.

Hitchcock (*Manual*) indicates no station in the Atlantic States south of northern Maryland.

SPARTINA CYNOSUROIDES (L.) Roth. JAMES CITY COUNTY: fresh tidal marsh of Chickahominy River, below Barrat's Bridge (or Ferry), no. 11,236.

Noteworthy as an extension inland beyond the saline shores. See the two following.

S. ALTERNIFLORA Loisel., var. *PILOSA* (Merr.) Fern. Inland to CHARLES CITY COUNTY: sandy tidal margin of Chickahominy River, Ferry Point, no. 10,911.

S. PATENS (Ait.) Muhl., var. *JUNCEA* (Michx.) Hitchc. Inland to CHARLES CITY COUNTY: sandy beach of James River southeast of Tettington, no. 11,235. See p. 396.

In dry fresh sand, associated with plants of strictly fresh habitats.

LEERSIA LENTICULARIS Michx. CHARLES CITY COUNTY: bottomland woods by Chickahominy River, north of Roxbury, no. 11,238. NEW KENT COUNTY: similar habitat, north of Long Bridge, southeast of Quinton, no. 11,239. NANSEMOND COUNTY: border of gum swamp at margin of Great Dismal Swamp, southeast of Whitmarsh School, no. 11,521. See pp. 397 and 400.

In view of Hitchcock's map, indicating no station in the Atlantic States north of South Carolina, and our records of it from Greenville and Southampton Counties (RHODORA, xxxix. 348, 353, 382 and map 22 (1937)), the stations in New Kent and in Nansemond Counties constitute notable local extensions of range.

PASPALUM URVILLEI Steud. To the stations in Warwick and Nansemond Counties reported in 1939 add the following. NANSEMOND COUNTY: roadside ditch east of Suffolk, no. 10,917. SUSSEX COUNTY: roadside ditch southeast of Wakefield, no. 10,918.

It is evident that this species is rapidly spreading northward.

PANICUM CAERULESCENS Hackel. Range extended inland to SOUTHAMPTON COUNTY: sphagnous swampy woods southwest of Applewhite Church, no. 10,104.

**P. CRYPTANTHUM* Ashe. SOUTHAMPTON COUNTY: bushy swales and borders of swampy woods near Blackwater River, Cobb's Wharf, no. 10,931. See pp. 364 and 383.

One of the rarest members of the genus, heretofore unknown between the region of Wilmington, North Carolina, and southern New Jersey. Near Cobb's Wharf (just north of the North Carolina line, on the west bank of the Blackwater River) there are several very large clumps. One-half of such a plant, broken into fragments, made 30 full sheets of representative material. The station, unfortunately, is within a rod or two of a plowed field.

P. CAPILLARE L. NEW KENT COUNTY: ditch at border of damp woods, near Fillbate's Creek, north of Holly Forks, no. 11,519.

The first time we have met this elsewhere usually common species on the Coastal Plain of Virginia.

P. AGROSTOIDES Spreng., var. *CONDENSUM* (Nash) Fernald. Tidal shores of James River, forming dense clumps up to 1.8 m. tall, with wide-branching panicles up to 3 dm. long and 1-1.5 dm. broad (several nos.). See pp. 286 and 391.

Just such plants from tidal shores all the way to Texas are referred in the Gray Herbarium by Hitchcock & Chase to *P. agrostoides*. I can get no satisfaction in separating them from *P. condensum* Nash. They have the longer spikelet of that plant, also the firmer foliage with broader midrib. Along the James these very tall clumps with panicles much exceeding the "rarely more than 5 cm. wide" of Hitchcock's *Manual* form thickets at high-tide limit. Farther out, they pass into an outer band (as at Wilcox Wharf, for instance) with plants down to 6 dm. high and with dense lance-ellipsoid panicles only 3-4 cm. thick. These are *P. condensum* as defined by the above authors, but they are clearly small individuals of the coarser plants which form part of the series of specimens listed by Hitchcock & Chase as "intermediate between *P. agrostoides* and *P. condensum*". Unfortunately some of the specimens cited by them as intermediate do have the coarse habit of the tall plants of the James and short spikelets which I cannot distinguish from those of *P. agrostoides*. If *P. agrostoides* and *P. condensum* are distinct

species, I shall welcome having their morphological distinctions pointed out.

ECHINOCHLOA COLONUM (L.) Link. JAMES CITY COUNTY: tidal shore of Back River, opposite Jamestown Island, no. 10,939.

The only time we have met this species, although Hitchcock (*Man.*) gives Virginia as its northeastern limit. Wiegand in his study of *The Genus Echinochloa in North America*, RHODORA, xxiii. 49–65 (1921), cited it from South Carolina southward and westward. See p. 385.

**E. PUNGENS* (Poir.) Rydb. (*E. muricata* (Michx.) Fern.). NANSEMOND COUNTY: roadside bordering sandy and sphagnum margins of thickets in pineland southwest of Marsh Hill School, south of South Quay, no. 11,242.

Not seen from Virginia by Wiegand, l. c.

**E. WALTERI* (Pursh) Nutt., forma *LAEVIGATA* Wiegand. (*E. longearistata* Nash). PRINCESS ANNE COUNTY: open muddy and sandy shore of Back Bay, east of Creeds, no. 10,940. SOUTHAMPTON COUNTY: swaley tidal shore of Nottoway River, Knight's Seine Beach (Battle Beach), no. 10,938. See p. 383.

Wiegand cites no material from Virginia; Nash gave the range, "South Carolina to Louisiana."

**SETARIA VIRIDIS* (L.) Beauv., var. *WEINMANNI* (R. & S.) Beauv. PRINCE GEORGE COUNTY: cinders of freight-yard of Norfolk and Western Railroad, east of Petersburg, no. 11,240.

F. T. Hubbard, in his *Taxonomic Study of Setaria italica and its immediate Allies*, Am. Journ. Bot. ii. 169–198 (1915), cited no material from south of New England.

ANDROPOGON* (§ *SCHIZACHYRIUM*) *praematurus***, sp. nov. (TAB. 626, FIG. 1–3), ab *A. scopario* recedit planta dense caespitosa 3–9 dm. alta; racemis 1–3 cm. longis 3–7-articulatis longe pedunculatis pedunculis filiformibus valde exsertis; rhachi undulato internodiis 3–5 mm. longis superne barbatis; spiculis sessilibus 5–7 mm. longis; spiculis pedicellatis saepe bene evolutis solitariis plerumque masculis 3.5–7 mm. longis.—Dry open woods, clearings and fields, southeastern VIRGINIA: dry gravelly soil northwest of Grove, York County, June 21, 1922, *L. F. & Fannie R. Randolph*, no. 353, as *A. scoparius* (in anthesis); dry sandy pine woods about 3 miles southeast of Petersburg, on headwaters of Blackwater River, Prince George County, June 25, 1936, *Fernald, Long & Smart*, no. 5593, as *A. scoparius*, var. *divergens* (in anthesis); dry fields and roadsides south of Petersburg, Dinwiddie County, June 8, 1938, *Fernald & Long*, no. 8094 (in an-

thesis); argillaceous field near Century House, northeast of Burgess, Dinwiddie County, September 13, 1937 (shattered), *Fernald & Long*, no. 7310; June 17, 1938 (in anthesis) *Fernald & Long*, nos. 8095 (foliage green) and 8096 (glaucous); border of dry woods near Assamoosick Swamp, about 2 miles northeast of Homeville, Sussex County, August 24, 1938, *Fernald & Long*, no. 8922 (fruit scattered); hickory and oak woods and clearings east of Skipper's, Greenville County, June 12, 1939 (in anthesis), *Fernald & Long*, no. 10,092 (TYPE in Herb. Gray.). SOUTH CAROLINA: grass-sedge bog or savannah, 1 mile west of Chicora, July 24, 1939 (shattered), *R. K. Godfrey & R. M. Tryon, Jr.*, no. 844.

Andropogon praematurus (see p. 357), when first found by us in June, 1936, at once challenged interest because of its extraordinary flowering season. Subsequently we have seen much of it, the plant consistently flowering from early June through the month (presumably into early July) but the inflorescences become quite shattered and the fruit scattered by August. *A. scoparius* and its varieties are autumn-flowering plants, in eastern Virginia very immature in September and in their prime through October. In *A. scoparius* the culms are mostly 0.5–1.5 m. high, the leaves 3–6 mm. wide, the racemes 3–7 cm. long, and the pedicels at each node are paired and truncate or terminated by a sterile rudiment. The early-summer *A. praematurus* is usually only 3–6 dm. high, though exceptional woodland colonies may reach a height of 9 dm.; its leaves are mostly 2–4 mm. broad; the racemes only 1–3 cm. long, with internodes only 3–5 mm. long. Most remarkable, the sessile perfect spikelets, instead of being accompanied by a pair of truncate bearded pedicels or these terminated by mere rudiments, usually are accompanied by a single well developed staminate pedicelled spikelet (FIGS. 2 and 3), though the terminal group may have 2 pedicelled spikelets. In well developed plants these characters are conspicuous; in some, however, only a few well formed staminate spikelets develop. All specimens display some of them and no second pedicel (except the terminal group).

Andropogon praematurus thus belongs in the remarkable group of species which retain well developed pedicelled staminate spikelets, these species being presumable ancestral types in which the pedicelled spikelets have not become reduced to mere



Photo. H. G. Fernald.

ANDROPOGON PRAEMATURUS: FIG. 1, TYPE, $\times \frac{1}{2}$; FIG. 2, raceme, $\times 1$, from TYPE; FIG. 3, upper half of raceme, $\times 5$, from TYPE.

A. DIVERGENS: FIG. 4, raceme, $\times 1$.

A. MARITIMUS: FIG. 5, raceme, $\times 1$.

rudiments or to truncate bearded pedicels, but in the three American species with this character the pedicelled spikelets are mostly solitary, instead of paired. The new species can not, however, be placed with either of the other North American species with the solitary pedicelled spikelets staminate. *A. divergens* Anderss.¹¹ is a coarser endemic of Texas, 0.8–1.5 m. high, with scarcely or barely exserted racemes (our FIG. 4) 3–4 cm. long, the internodes of the rachis 4.5–7 mm. long, the sessile spikelets and the pedicelled staminate ones 6–8 mm. long. The three sheets of it before me (*Cory*, nos. 25,510, 25,840 and 26,064) were all collected in October. *A. praematurus* is certainly very closely related to it, but it differs in its much lower stature, its long-exserted racemes with internodes only 3–5 mm. long, the spikelets mostly smaller. These differences, associated with the pronounced difference in flowering season and the geographic isolation, sufficiently distinguish *A. praematurus*.

From *Andropogon maritimus* Chapm., of the coast of the Gulf of Mexico, *A. praematurus* is abundantly distinct. *A. maritimus* is a stout and stoloniferous non-cespitose species with conspicuously distichous divergent leaves, racemes (FIG. 5) partly included and 4–6 cm. long, the spikelets 8–10 mm. long.

Whether the break in the range of *A. praematurus* (Southeastern Virginia, reappearing in southeastern South Carolina) is an actual one may be doubted. It is probable that the species occurs also in southeastern North Carolina, a region sharing many of the peculiar plants of Southeastern Virginia.

In PLATE 626, FIG. 1 is the type of *Andropogon praematurus*, $\times \frac{1}{2}$; FIG. 2, a raceme, $\times 1$, from the TYPE; FIG. 3, upper half of raceme, $\times 5$, from TYPE; FIG. 4, raceme, $\times 1$, of *A. divergens* Anderss., from near Alba, Texas, *Cory*, no. 25,510; FIG. 5, raceme, $\times 1$, of *A. maritimus* Chapm., from Horn Island, Mississippi, *Tracy*, no. 3786.

**A. VIRGINICUS* L., var. *GLAUCUS* (Muhl.) Hack. (*A. capillipes* Nash). NANSEMOND COUNTY: dry white sand of pine barrens, east of Cox Landing, south of South Quay, no. 10,943. See pp.

¹¹ *Andropogon maritimus* and *A. divergens* were treated by Hackel as *A. scoparius* Michx., subsp. *maritimus*, α . *genuinus* and β . *divergens*, Hackel, *Androp.* (in *DC. Mon. Phan.* vi.), 385 (1889), the subspecies distinguished by the staminate pedicelled spikelets. Var. *divergens* was based upon a specimen from Texas which bore the herbarium name *A. divergens* Anderss., published in synonymy by Hackel. Taken up as a species its author is Andersson ex Hackel in syn., not *A. divergens* (Hackel) Anderss., the authorship ascribed to it by Hitchcock. Andersson died nine years before his manuscript name was published by Hackel. In *RHODORA*, xxxvii. 143, 144 (1935), Griscom and I wholly misinterpreted *A. divergens*. The plant there called by us *A. scoparius*, var. *divergens* is var. *polycladus* Scrib. & Ball.

First from north of southern North Carolina.

A. VIRGINICUS, var. *TETRASTACHYUS* (ELL.) Hack. To the single recorded Virginian station (at Cape Henry; see Fernald & Griscom in RHODORA, xxxvii. 142) add two in NANSEMOND COUNTY: seeping bank of ditch at margin of woods, about 2 miles southeast of Cleopus, no. 9513; dry white sand of pine barrens, east of Cox Landing, south of South Quay, no. 10,944.

ANDROPOGON VIRGINICUS L., var. *HIRSUTIOR* (Hackel) Hitchc., forma ***tenuispatheus*** (Nash), comb. nov. *A. glomeratus tenuispatheus* Nash in Small, Fl. Se. U. S. 61 (1903). *A. tenuispatheus* (Nash) Nash in N. Am. Fl. xvii. 113 (1912). *A. virginicus* var. *tenuispatheus* (Nash) Fernald & Griscom in RHODORA, xxxvii. 142 (1935).

Forma *tenuispatheus* seems to be only a glabrous form of the hirsute-sheathed var. *hirsutior*. In making the transfer of the name *tenuispatheus* as a variety to *A. virginicus*, with var. *hirsutior* as a hirsute form, *A. virginicus*, var. *tenuispatheus*, forma *hirsutior* (Hackel) Fern. & Grise. l. c. (1935), Griscom and I overlooked the fact that as a varietal name *A. macrourus*, γ . *hirsutior* Hackel (1889) has priority over *A. glomeratus tenuispatheus* Nash (1903).

(To be continued)

A PELORIC FLOWER IN *GERARDIA TENUIFOLIA*.—Some years ago a specimen of *Gerardia tenuifolia* with a greatly enlarged and deformed terminal flower was found at Woodstock, Connecticut, by Mrs. Clarence Dextrase and brought to me. I laid it aside, hoping to visit the colony from which it came. This I have not been able to do; but the case of peloria seems worth recording.

In my specimen, now in the Gray Herbarium, all the flowers are normal except the terminal one on the main stem. In it, all the parts are doubled; there are ten calyx-lobes, ten stamens and two pistils. These organs, so far as can be determined without dissection, are normally developed, or nearly so. The corolla, however, not only has twice the usual number of lobes, but is split down one side and opened out, forming a somewhat irregular, nearly rotate perianth 3 cm. in diameter.

Similar pelorias have been reported by Penzig (Pflanzen-Teratologie, ed. 2, iii. 111, 115) in *Digitalis* and *Penstemon*. They seem not to have been previously recorded in *Gerardia*.

In *Digitalis*, the polymeric flower tends to take on the character of a shoot, even developing rudimentary secondary flowers in the axils of separated calyx-lobes or other organs. No such tendency appears in the *Gerardia*.—C. A. WEATHERBY, Gray Herbarium.

VASCULAR PLANTS OF EASTERN ARCTIC CANADA.¹—Part I of Dr. Nicholas Polunin's "Botany of the Canadian Eastern Arctic" is a welcome addition to the small group of truly comprehensive papers on the boreal American flora. It will be indispensable to anyone concerned with the plant geography or systematic botany of the American arctic. Part I contains the vascular plants, and according to the Foreword Part II will be on fungi, lichens and mosses, Part III on vegetation and ecology, and Part IV on the "Subarctic Regions." The area involves all land "north of the 60th parallel of latitude and east of longitude 95 degrees west, with the exception of Axel Heiberg Island, Boothia peninsula, and the inland parts of Keewatin." The volume begins with a brief account of the history of exploration and a rather comprehensive list of localities from which plant materials are available. The author estimates having seen between 50,000 and 60,000 specimens, scattered among the principal American and European herbaria. The separate specific entities enumerated total 297, to which are added a considerable number of geographic varieties and minor forms. As in most arctic regions, the families most heavily represented are the *Gramineae*, *Cyperaceae*, and *Compositae*. Fourth in the list are the *Caryophyllaceae*. Following the detailed enumeration of the species there is a summary list with a tabular arrangement of geographic distribution within the area. A large bibliography and a plant-index close the volume.

Dr. Polunin's treatment of the difficult and polymorphic arctic species-complexes is essentially conservative. He has not shown a tendency to "split" excessively, but has given ample recognition to lesser taxonomic units such as varieties and forms. He maintains, throughout his nomenclature, the concept of "Linnaean" species with geographic and other subdivisions of minor rank. Under each species in the catalogue there are only such synonyms as are required to make the list workable with other current papers touching the region. Then comes a brief critical discussion of variations and related matters of systematic interest. The geographic and habitat data are divided into "general distribution," "arctic distribution," "occurrence," and finally a list of cited specimens arranged in a geographic sequence. Four new species, 10 new varieties, and 9 new forms are described.

The book will be valuable not only because it brings up to date the listing of available specimen-material for the study of eastern arctic botany, but also because it contains a remarkably complete survey of the recent literature of the subject. Anyone attempting critical studies of boreal American groups will appreciate this, for the taxonomic literature on our boreal flora has become exceedingly voluminous and

¹ *Botany of the Canadian Eastern Arctic*, by Nicholas Polunin. Part I. *Pteridophyta and Spermatophyta*. National Mus. of Canada Bull. No. 92 (Biol. Ser. No. 24). pp. 1-408. map. 1940.

difficult to assemble. One could wish that the book contained keys and brief diagnoses which could be used for identification of specimens. There are those who will be critical of the voluminous discussions, which contain all sorts of odd bits of information about the plants and their habitats as well as about the author's personal reactions to them. To such critics the reviewer recommends that they read and be entertained as well as enlightened. When Dr. Polunin was at the Gray Herbarium, we had long arguments about how this book should be written, the present writer holding out for a condensed, telegraphic style. He can now admit only pleasure and satisfaction from reading Dr. Polunin's delightful purveyance of the opposite.—HUGH M. RAUP, Arnold Arboretum.

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